SPECIAL—REPORT OF NATIONAL CONVENTION OF CEMENT USERS
. XXVIII. February, 1905. No. 2.

MUNICIPAL ENGINEERING

A MONTHLY MAGAZINE

DEVOTED TO THE IMPROVEMENT OF CITIES

PAVING, SEWERAGE, WATERWORKS,
STREET LIGHTING, PARKS, STREET CLEANING,
GARBAGE DISPOSAL, PUBLIC SANITATION, BRIDGES.

SMITHSONIAN

PUBLISHED BY
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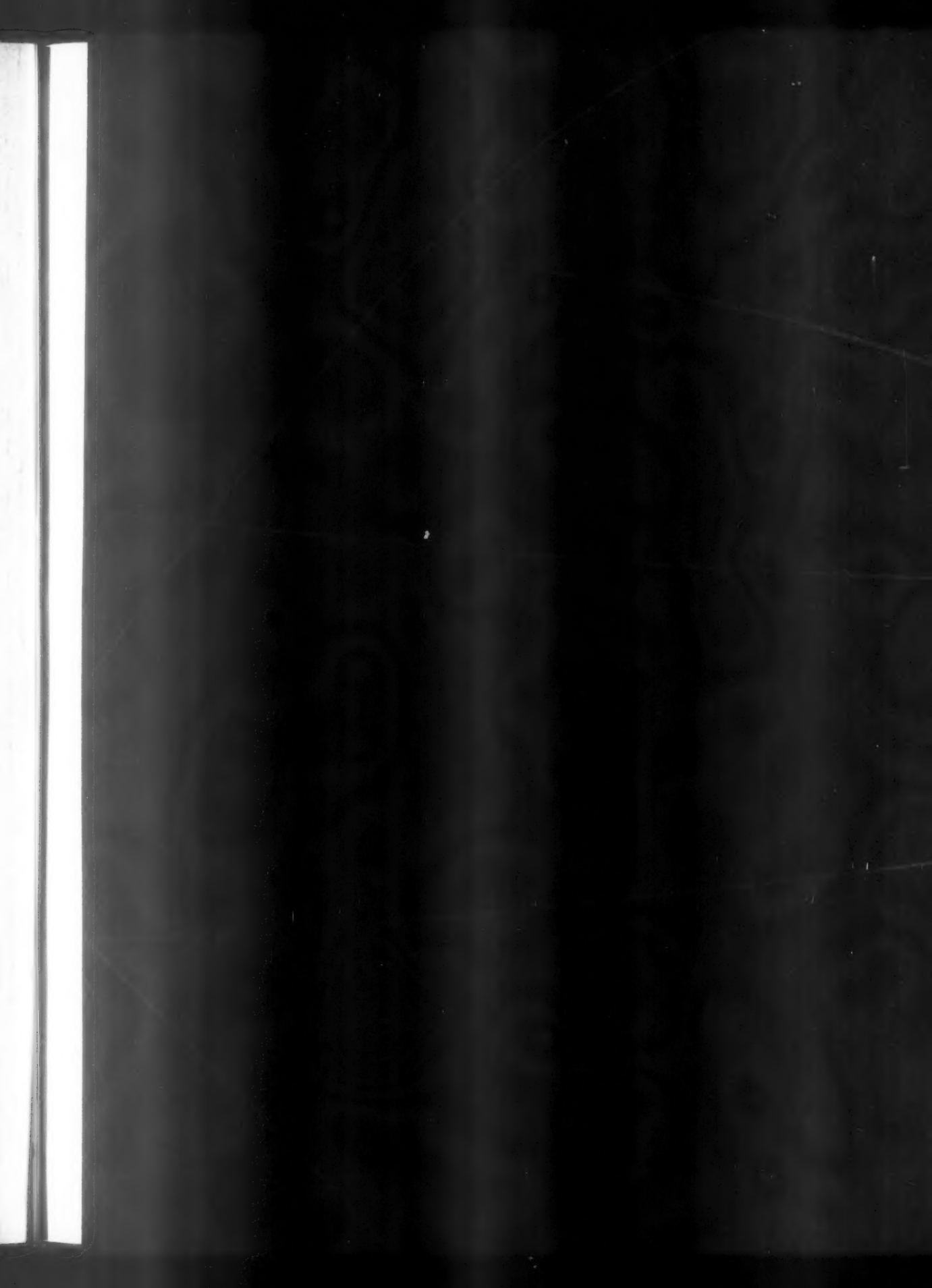


MUNICIPAL ENGINEERING

VOLUME XXVIII FEBRUARY, NINETEEN HUNDRED FIVE NUMBER TWO

STONE AND BRICK SIDEWALKS.

By J. C. Herring, City Engineer, Jefferson City, Mo.

Natural Stone Sidewalks—The walks shall be laid with the best quality of limestone or sandstone flagging or other stone of approved quality, from ledges known to withstand the effects of frost, and which shall be free from seams or other defects.

The slabs shall not be less than three inches in finished thickness, where laid on the ground, nor less than six inches, where resting directly on metal beams over areas or vaults.

Their width shall be not less than three and one-half feet nor their length less than six feet, excepting where the walk is less than six feet in width, in which case their length may equal the width of the walk.

The wearing surfaces of the stones shall be true planes with a finish at least equal to good bush-hammered limestone.

The edges and ends shall be cut straight and true to line for their full length and a depth of not less than one and one-half inches down from the surface.

When not laid over areas or vaults they shall be firmly bedded in the sub-foundation with the surface true to grade and close joints throughout.

When made to cover open areas or vaults they shall be laid on iron or steel beams or heavy T rails according to special plans and specifications furnished or approved by the City Engineer.

The sub-grade shall be excavated to a uniform depth of not less than nine inches below and finished parallel with the finished surface of the walk.

The sub-foundation may be composed of clean, coarse sand, fine gravel or cinders, and of such depth (not less than six inches) as to bring the surface of the walk to the proper grade when thoroughly compressed.

When driveways occur, six-inch flagging, properly grooved, to prevent their being slippery, may be used, or the construction specified for driveways over artificial stone flagging may be employed, or when the street is paved with brick the driveway construction specified in connection with brick sidewalks may be used.

Brick Sidewalks—First-class brick sidewalks may be constructed with the brick set on edge or laid flatwise.

When set on edge the brick must be without flaws or cracks, straight-edged, of compact texture and regular and uniform in shape and size; they may be either of the best quality of hard-burned brick with a clear metallic ring, burned hard entirely through, or a good quality of vitrified paving brick.

When laid flatwise the brick must be either repressed vitrified pavers or hydraulic pressed brick of the best quality, without flaws or cracks, perfectly straight edges, uniform in shape and size, with surface true and smooth and corners square.

Samples of brick proposed to be used in the walks shall, when required, be furnished the City Engineer, who will subject them to such physical tests as he may deem necessary, and any brick found to be unsuitable for the purpose will be rejected and bats smaller than half brick will not be allowed.

The bricks are to be laid or set at right angles with the line of the street, or when laid flatwise they may be laid in herringbone style as directed or approved by the Engineer.

When the bricks are laid at right anbles with the line of the street the longitudinal joints shall be regularly broken

by a lap equal to one-half the length of the brick.

To avoid the use of bats smaller than half brick in walks of less width than the full space between the curb and the building lines, a variation of not more than two inches from the specified width of the walk may be allowed by the Engineer.

The border of the walk and the ends, where not joined to other suitable walk or curb, shall be finished with a continuous row of bricks on edge, excepting where one side abuts against the curb, in which case it may be omitted from the curb side, and if required to complete the prescribed width of walk, a double row, breaking joints with each other by a lap of one-half the length of a brick, shall be set on opposite side.

The sub-grade shall extend the full width of the finished walk, parallel with and ten inches below its finished surface when thoroughly compacted.

Upon the sub-grade shall be laid a sub-foundation of cinders, fine bank gravel or broken stone, no piece to be more than one and one-half inches in its largest dimensions, with sufficient fine particles to completely fill all voids between the larger, watered and rammed into a firm compact bed with a smooth, even surface parallel with the finished surface of the walk and four inches below it, where bricks are to be laid flatwise, or six inches where bricks are to be set on edge.

Upon this foundation shall be laid a bed of fine, clean, sharp sand, artificially dried if necessary, of sufficient thickness to bring the surface of the walk to the proper grade after the bricks have been properly laid and imbedded in it.

Special care shall be observed to make the surface of the bed of sand parallel with the surface of the finished walk.

The brick must be laid by thoroughly skilled pavers, standing or kneeling upon those already laid and not upon the bed of sand.

Each course must be of brick which are perfectly uniform in width and depth and with tight joints throughout.

When thus laid the joints between the bricks shall be filled with clean, fine, sharp, dry sand, free from loam or earthy matter; and if directed by the Engineer screened through a No. 16 sieve having 256 meshes to the square inch.

The brick shall then be carefully rammed by placing a plank over several courses and ramming the plank with a heavy maul or hammer.

The ramming shall be continued until the bricks reach a firm, unyielding bed and present a uniform surface with proper grade and shape.

Any lack of uniformity in surface must be corrected by taking up and relaying.

When the ramming is complete, a sufficient amount of fine, dry sand, as described above, shall be spread over the surface and swept or raked into the joints.

Wherever driveways occur the bricks may be set on edge parallel with the curb line and built in conformity with the specifications for brick pavement.

Hexagon Block Sidewalks—The hexagon blocks shall not be less than two inches in thickness and eighteen inches across, measured between parallel edges, excepting for walks of less than six feet in width, where they shall measure not less than fifteen inches between parallel edges; they shall consist of two parts as follows:

A wearing surface or finishing course of not less than one-half inch in thickness laid on a base of such depth as to complete the thickness of the block.

They shall be composed of Portland cement and sand, fine particles of crushed granite or other suitable rock, the fragments to be as nearly cube-shaped as practicable, perfectly fresh and clean, in sizes from three-eighths of an inch downward.

With these ingredients will be made a fine concrete mixture which shall, in the opinion of the City Engineer, be at least equal in strength, durability and finish to the best results obtained from the following:

A base course one and one-half inches in thickness composed of one part of Portland cement and two parts of the best quality of river sand, cleaned and free from dust, dirt and rubbish of all sorts.

A finishing course one-half inch in thickness composed of equal parts of Portland cement and the best grade of river sand, perfectly clean and properly screened to the sizes that will pass through a No. 16 and be retained in a No. 30 sieve, having 256 meshes per square inch.

The whole to be skilfully mixed, properly compressed in the moulds and finished in a thorough and workmanlike manner

The hexagon blocks shall be laid on a

fine concrete or mortar composed of one part Portland cement and three parts of clean, coarse, sharp river sand and shall not be less than one and one-half inches in thickness when well rammed into the sub-foundation. Said mortar bed shall extend three inches on each side of the walk proper to support the binder, which shall be beveled off from the upper edge of the hexagon block to the outer edge of the mortar bed.

This binder shall be composed of Portland cement and sand of the quality and in the proper proportions above specified. for the finishing course of the hexagon blocks.

The sub-grade shall extend the full width of the walk, including the binders above specified, and shall be excavated to an average depth of ten inches below the finished surface of the same.

It shall be finished parallel with the surface of the walk, or may be left one-half of an inch high under the center of the walk with a corresponding increase of depth at the edges to prevent the seepage of water under the sub-foundation.

The sub-foundation shall be composed of cinders, gravel or broken stone, as specified for artificial stone sidewalks, of the proper depth (not less than six inches) to bring the finished walk to the proper plane and grade.

When the walk is located against the curb the bevel binder may be omitted from that side and the hexagon blocks placed against the curb.

Wherever driveways occur they may be constructed in all respects as specified for driveways over artificial stone walks or where the street is paved with brick the construction specified in connection with brick sidewalks may be employed.

THE WATER FILTRATION PLANT OF THE KOLAR GOLD FIELD AT MYSORE, INDIA.

By Edmund B. Weston, M. Am. Soc. C. E., M. Inst. C. E., Providence, R. I.

Kolar Gold Field—Eminent writers have advanced arguments in favor of India being the Ophir of Scripture. Of the wealth derived from India by Solomon, many of the incidents recounted in the Ramayana, B. C. 1300, the more ancient of the two great epic poems in Sanskrit, show that Mysore at that time was a flourishing state. So long ago as the time of Pliny the mines of gold and silver in the country of the Nareae in South India were famous, and as Mysore borders on the country of the Nareae, probably it was the gold mines of Mysore that were meant.

The Kolar Gold Field occupies a small tract of country about sixty miles from Bangalore in the eastern extremity of the state of Mysore in South India and belongs to the government. It is situated on a plateau about 3,000 feet above the level of the sea and stretches north and south a distance of about 40 miles and has a varying width of from about 1 to 4 miles. There are about 36 square miles held under lease at the present time by the mining companies. The gold field, though one of the smallest in the world in point of area, is one of the richest—if not the richest—in point of gold production. The annual output at the present time is about $11,000,000 and the industry gives employment to some 20,000 mining men, hundreds of whom are miners from Great Britain.

The Kolar Gold Field is almost barren of vegetation and dotted and scarred with great piles of crushed quartz, begrimed from numerous smoking chimneys and noisy from the rattle of hoisting engines and stamp mills and hideous from long rows of native bungalows of corrugated iron, it appears a typical mining camp with attendant scarcity of water and fuel.

The only water supplied to the inhabitants of the gold field has been pumped from the mine shafts and was very inferior in quality, and so short in quantity as to make it necessary to guard the taps from which the natives are supplied. A long line of native women could be seen daily awaiting their turn to get the one or two pots of water allowed them, the filling of which is superintended by a native guard.

Projects for Water Supply—The development of the Kolar Gold Field has shown the necessity for a better water supply and the need of good water was imperative as far back as 1891, and between 1891 and 1901 several projects for

supplying the Kolar Gold Field with water were considered, but a definite project was not decided upon. Finally in 1901 Mr. V. Rungasamy Iynegar, Executive Engineer of the Hessargata Water Supply Division in Bangalore, was asked to prepare a project. In that year he submitted his report to the government, which considered it for nearly a year. This project was sanctioned in April, 1902, and $324,000 appropriated for the work, which commenced at once under the direction of the present Chief Engineer, Mr. W. McHutchin, M. Inst. C. E., and under the supervision of Mr. J. J. Whitely, M. Inst. C. E., Superintendent Engineer of the Eastern Circle. The work of construction was intrusted to Mr. V. Rungasamy Iynegar, Executive Engineer, and his assistant, Mr. K. Srinivas Aynegar, A. C. E., Assistant Engineer.

Mr. Iynegar's project provided for a pumping station and filter plant, capable of supplying 2,400,000 U. S. gallons per 24 hours. Two large tanks, known as the Betmangala and Holali, were reserved as a source of supply and a site for the plant was selected near the outlet of the Betmangala tank and on the outskirts of the little village of Betmangala. These two tanks or artificial lakes are of the type seen throughout India and are made by throwing up huge embankments of earth, known as bunds, across river valleys. The water thus stored is generally used for irrigation purposes, and is one of the sources of revenue to the government.

Betmangala Tank—The Betmangala tank alone is sufficient to supply the water required for each year, as it has a catchment area of 13.28 square miles and a capacity of 1,737,612,000 U. S. gallons. The Holali tank, which is higher up the valley, is simply a reserve in case of an exceptionally bad year when the rainfall is slight. The rainfall at Betmangala averages about 17 inches per annum.

Selection of Type of Filter—The selection of the kind of filter to be used was delegated to Major A. J. de Lotbiniere, R. E. (then Captain), who, after personally investigating the subject, decided upon an American type of mechanical filter.

Plans and Superintendence—Mr. Edmund B. Weston, M. Am. Soc. C. E., M. Inst. C. E., prepared the detail plans of the filters and their auxiliaries, the detail plans of the coagulation and subsidence basin and the preliminary plans for the entire filter plant, taking into account information furnished by Major de Lotbiniere. Mr. R. W. Lawton was the Superintendent of Construction at Mysore during the building of the filter plant.

FILTRATION PLANT AT MYSORE, INDIA.
Front of Building at End of Driveway.

The actual work of clearing the site and opening roads was commenced in February, 1903, and the construction of staff headquarters, inspection bungalow, filter building, coagulation and subsidence basin and filtered water reservoir was started about two months later and the entire work was practically completed in April of this year.

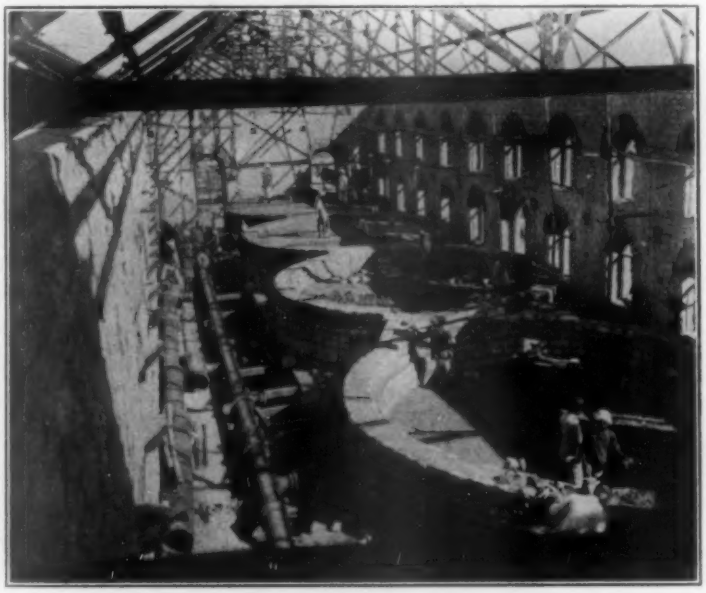
The filter plant consists mainly of a filter building containing the filters and their auxiliaries, the low lift pumps for raising the raw water to the coagulation and subsidence basin, the high lift pumps for pumping the filtered water to a distributing stand tank in the gold field, and the steam boilers; a coagulation and

subsidence basin and a filtered water reservoir into which the water flows from the filters.

Comfortable and tasteful staff bungalows with tile roofs line a broad driveway which runs through the village of Betmangala to the filter plant. At the end of the driveway there is an inspection bungalow which was built at an expense of about $4,900. This is intended for the inspection officers and is supplied with furniture and plate and three servants, which are furnished by the government. The bungalow is spacious and conveniently arranged and overlooks the filter plant and the great Betmangala tank.

The filter building is composed of a pump room, filter room, boiler and economizer room, store room, shop and office. The walls are constructed of granite masonry laid in mortar. The exterior walls of the building are pointed outside with Portland cement mortar and the inside and the interior walls are plastered with ordinary mortar. The roof is of corrugated galvanized iron and is carried on iron trusses, which are from ten feet to twelve feet apart. A monitor runs the full length of the roof. The pump room floor and operating platform in the filter room are of teak, and all other floors are of tile and stone slabs. (Photograph No. 1.)

Filters—There are four circular filters of the gravity type. Each filter has a filter-bed 3.5 feet deep and 17 feet in diameter. The exterior tanks are constructed of granite masonry laid in "surki" mortar, which is ordinary lime mortar with a mixture of burnt brick powder, and plastered outside with this mortar and inside with Portland cement mortar; the walls of the interior tanks are built of brick, laid in Portland cement mortar. (Photograph No. 2.)



FILTRATION PLANT AT MYSORE, INDIA.
2. Filters under Construction.

Each filter has a capacity of 620,000 U. S. gallons per 24 hours, the rate of filtration being about 119,500,000 U. S. gallons per acre per 24 hours.

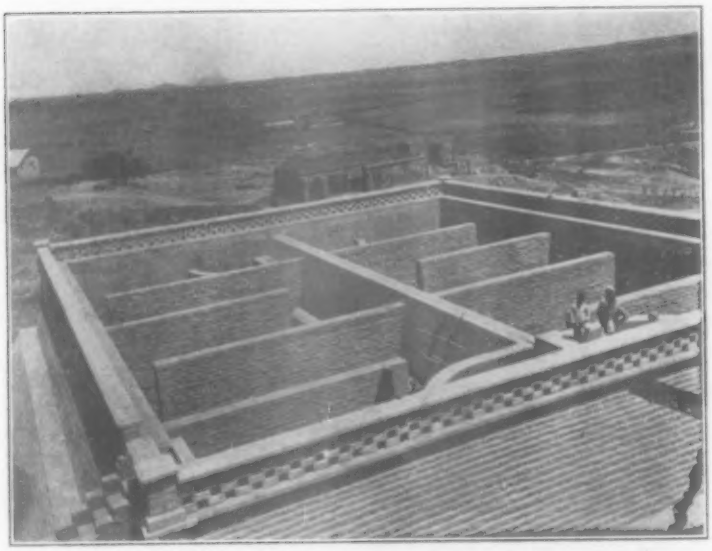
Pumping Machinery—The pumping machinery in the filter building comprises: Three high lift pumping outfits, each composed of an English triple-expansion, condensing, vertical engine connected to a three-throw horizontal Worthington pump. Each has a capacity of 1,200,000 U. S. gallons per 24 hours. They are so designed as to admit of electric driving in the future by the addition of motors and the disconnection of the engines. It is the intention eventually to

provide the electric power from the Cauvery Falls, in which case it is estimated that the saving in fuel will be about $14,274 per annum. Two low lift pumping outfits, each consisting of a centrifugal pump directly connected to a high-speed non-condensing vertical engine have each a capacity of 2,640,000 U. S. gallons per 24 hours. Two Babcock & Wilcox steam boilers, each of 225 H. P., with Green economizers. A centrifugal pump having a capacity of 2,000 U. S. gallons per minute to be used in washing the filter beds, to be driven by belt by a Pelton wheel, which is operated with water from the 16-inch high-pressure main. The Pelton wheel is so arranged that when the filters are not being washed it can drive, by belt, shafting in the workshop.

Each filter has a capacity of 620,000 U. S. gallons per 24 hours, the rate of filtration being about 119,500,000 U. S. gallons per acre per 24 hours.

Coagulation and Subsidence Basin—The coagulation and subsidence basin is adjacent to the filter building, and is, with the exception of the bottom, which is of concrete, constructed of granite masonry laid in mortar, lined on the inside with brick laid in "surki" mortar. The brick lining is well bonded to the stone work and is plastered with one inch of Portland cement mortar. The outside of the walls is pointed with Portland cement mortar. The basin is divided into two sections by a partition wall through the center and each section is provided with a system of baffle walls. There is an ornamental dressed stone parapet around the top of the basin and a flight of stone steps lead up from in front of the filter room to the top of the basin. (Photograph No. 3.)

Filtered Water Reservoir—The filtered water reservoir is located about thirty feet from the filter building, and is below the ground level and covered. The walls are built similar to those of the coagulation and subsidence basin. The roof is constructed of masonry. Granite pillars support granite girders, across which are laid flat stone slabs, side by side, and there is a leveling course of concrete over the stone slabs. The roof is provided with ventilators and is ornamentally arranged for pots of flowers. (Photograph No. 4.)



FILTRATION PLANT AT MYSORE, INDIA.

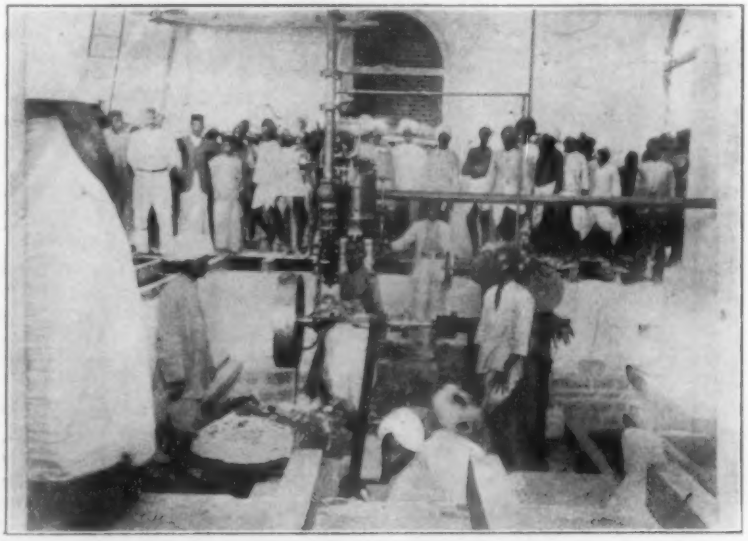
3. Coagulation and Subsidence Basin.

All of the granite which was used in the construction of the filter plant was quarried in the immediate vicinity.

The filtered water will be pumped from the filtered water reservoir at the filter plant through a main pipe line over seven miles in length, to the stand tank at the Champion Reefs Mine in the gold field. The pipe is of steel and sixteen inches in diameter and one-fourth inch in thickness. There are seven stop valves, seven

FILTRATION PLANT AT MYSORE, INDIA.

4. Top of Filtered Water Reservoir, and end of Filter Building.



FILTRATION PLANT AT MYSORE, INDIA.

5. Native Ceremonies on Starting Filters.

air valves, and one check valve on the line. The pipe is laid three feet below the surface of the ground, and all of the valves are enclosed in masonry chambers having iron manhole covers. The total working head, including friction, is 500 feet. The distribution pipe lines are all of cast iron and range in diameter from ten inches to three inches. There is also a Venturi meter on the main pipe line, which is located near the stand tank, which will measure the actual amount of water supplied to the Kolar gold field.

The stand tank at the Champion Reefs Mine in the gold field is 35 feet in diameter and constructed of brick laid in cement mortar and bound with iron bands. The wall is 18 inches in thickness and 10 feet high. The tank is plastered inside and out with Portland cement mortar. All of the filtered water will be pumped to this tank and branch distribution pipes lead from it to the different mines and to the service reservoir of the town of Robertsonpet about a mile distant. This service reservoir is built similar to the filtered water reservoir at the filter plant, with the exception that a partition wall divides it into two compartments. It has a capacity of about 259,200 U. S. gallons, which is estimated as three days' supply for Robertsonpet, which has about 10,000 inhabitants.

Smaller tanks at the different mines will receive the share of water allotted to them in the following proportions per 24 hours: Mysore Mine, 450,000 U. S. gallons; Champion Reef Mine, 594,000 U. S. gallons; Coregaum Mine, 360,000 U. S. gallons; Nundydroog Mine, 270,000 U. S. gallons; Gold Field Mine, 36,000 U. S. gallons; Nine Reefs Mine, 27,000 U. S. gallons; Golconda Mine, 27,000 U. S. gallons, and Balaghat Mine, 36,000 U. S. gallons. The balance will be supplied to Robertsonpet and to the government buildings in the gold field.

Native Ceremonies—Native ceremonies were conducted when the filter plant was first tested on March 28, an account of which may be interesting. A horoscope was cast to find an auspicious moment for starting the machinery. By daylight the native employes were at work marking all the wheels, wheel stands, agitator beams, coagulant tanks, and, in fact, everything connected with the filters, with caste marks. All about the filter building were green leaves and flowers. In front of the low lift pump were two or three bushels of roasted rice and bananas, cocoanuts and a sacrificed goat, and all around it was burning sandal wood. A native tom tom band was in attendance. In accord with it all, it became necessary for the hands and arms of the Superintendent of Construction to be anointed with sacred oils before he opened the "throttle" that set the machinery in motion. (Photograph No. 5.)

TOOLS FOR CLEANING SEWERS.

The accompanying cut shows a number of tools for cleaning sewers and is an interesting addition to the collection of tools shown in connection with the article of B. E. Briggs on sewer cleaning in Municipal Engineering, vol. xxvi, p. 418.

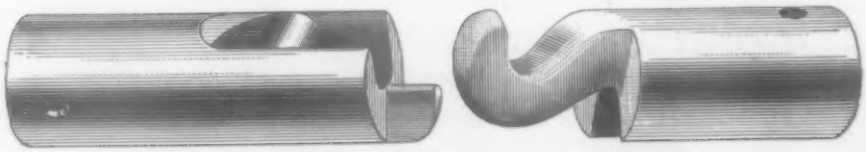
No. 1 is a root cutter, which will prove a valuable aid to the many engineers and sewer superintendents who have trouble with tree roots growing through defective pipe joints or open joints in small brick sewers.

No. 2 is a scraper for removing deposits of the softer materials which are still too dense or too sticky for flushing out.

No. 3 is a corkscrew which will penetrate any bundle of rags or paper and either pull it out or disintegrate it.

No. 4 is a plunger which is of special value in conduits to remove roughness when they have not been thoroughly cleaned before laying.

No. 5 is a chisel for use in breaking off hard cement left on unwiped joints, which projects and catches rags, paper, etc. It will also serve to cut off hard



JOINTED ROD FOR OPERATING SEWER CLEANING TOOLS.

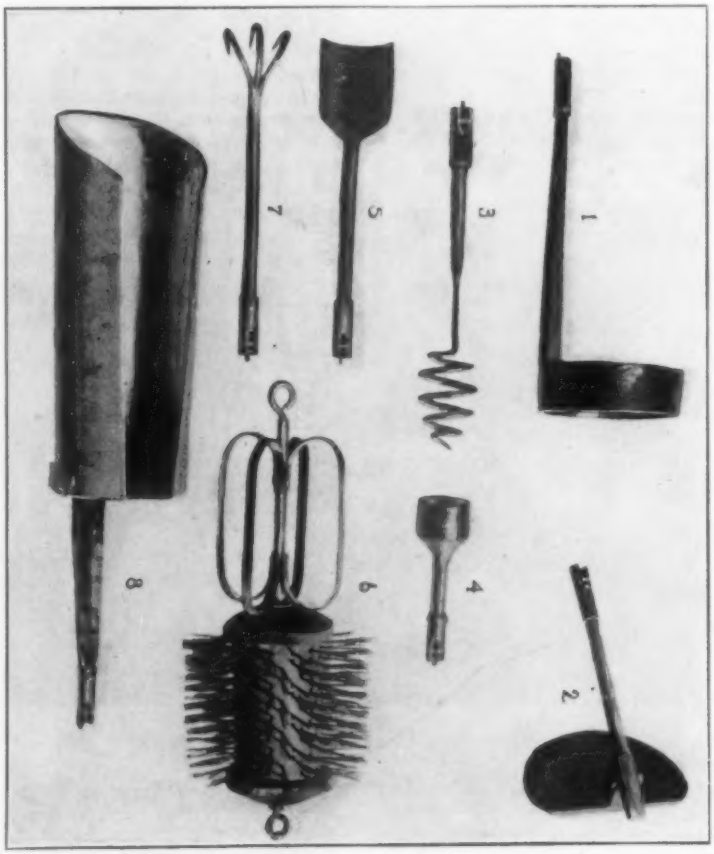
materials which have caught in open places in joints. A corset steel has been known to stop a pipe sewer by catching in such an opening in a joint and serving as a hook on which to hang a miscellaneous lot of obstructions that followed.

No. 6 is a brush which easily removes the accumulations of grease on the walls of sewers near hotels, boarding houses and certain manufacturing plants.

No. 7 is a claw which is sometimes needed in place of the scraper, No. 2, and may stir up such soft but adhesive materials as do not yield readily to the scraper, when they may be flushed or scraped out.

No. 8 is a scoop for removing deposits of sand from sewers. It sometimes happens, especially in new sewers, that a heavy rainfall will wash deposits of sand gravel or clay into a long line of pipe, practically filling it. These deposits are hard to remove in pipe sewers and in the smaller brick sewers. The scoop can be operated for several hundred feet successfully, though slowly.

All these tools are fitted with sockets for use with the Felton coupling for sewer rods, which permits any desired manipulation of the tool on the end of a string of rod sections and at the same time makes easy the removal of the rod in sections at a manhole. The coupling is shown in the smaller of the accompanying cuts. It can be used also for pushing a lantern through a sewer for the discovery of leaks or surreptitious connections, whether in pipe or brick sewers.



TOOLS FOR CLEANING SEWERS.

A PECULIAR RESERVOIR FAILURE.

By G. H. Herrold, Red Wing, Minn.

On the night of Nov. 19, about 7 p. m., the city reservoir at Red Wing, Minn., discharged its contents of a million gallons into a crevasse in its natural rock foundation, and, bursting out of the side of the hill about 40 ft. below, deluged the lawns and cellars of the residences in the vicinity and completely wrecked one ten-room house and a barn.

The reservoir was built about twenty years ago and is 80 ft. in diameter and 26 ft. deep, excavated in solid rock in a bench of a bluff in the east part of town about 250 ft. above the river. The pressure at the pump house just off of Main-st. is 225 pounds.

The floor had a coating of concrete, apparently natural cement, about 4 inches thick, without any reinforcement over a crack in the natural rock floor which the oldest inhabitants claim was there at the time the work was done.

A slight faulting of the rock on this plane opened a crevasse a few inches wide, which destroyed the integrity of the concrete, and the water poured into the crevasse until the pressure was sufficient to burst out the side of the hill about 220 ft. horizontally from the beach. Rocks, turf and trees were hurled with great force against the buildings at the foot of the hill, followed by a rush of water.

Apparently the foundations of the reservoir are unharmed, but the city will obtain expert advice before repairing the breach.

FAILURE OF RESERVOIR, REDWING, MINN.

After the first burst of the water the opening in the side hill closed, the balance of the water squirting out in a thousand streams through the interstices of the shattered rock ledge.

The picture shows the roof of the reservoir, the rock ledge bared of trees and turf where the water burst out and the house wrecked by the debris.

This house stands at the end of a row of cottages on McSorley-ave., the avenue being parallel to the flow of water from the reservoir.

EDITORIAL COMMENT

The Cement Users Convention.

The Asphalt Situation.

Fuel and Cement Testing at St. Louis.

THE CEMENT USERS' CONVENTION.

A full account of the Indianapolis convention of the National Association of Cement Users will be found elsewhere in this number. It is only necessary in this place to express the general satisfaction with its outcome in the minds of all those who attended it. No one expected so large or so enthusiastic a convention, except those directly engaged in the work of preparing for and advertising the meeting, and many, knowing the diversity of interests which would be represented, feared that business antagonisms would result in friction which would interfere with the harmony of the meeting.

The great majority of those at the meeting were men who are directly engaged in the manufacture of cement and concrete products, men who have no business antagonisms, men who were present to learn and to impart the knowledge they had themselves obtained. They wanted knowledge concerning machinery and materials as well as concerning their use, and they obtained it, the former from the exhibits and the latter from the convention proceedings. These men are the customers of the machinery and material men and must be treated with business courtesy. The consequence was an enthusiastic convention with just enough of the contesting elements to give zest to the unofficial proceedings, between convention sessions, and to add the warmth to the blood which is needed to start a new organization into vigorous life.

The constitution adopted seems to have met with general favor in its final form, a few details perhaps requiring early attention. The convention was large enough to warrant the division of the Association into sections for a portion of the convention sessions in future meetings. The form of this division and the method of selection of vice presidents for these divisions insures representation of every interest in the Association upon the Executive Board, thus conducing to fair treatment of all.

The list of general officers selected is as nearly representative of all classes of members as it was possible to secure in the state of ignorance concerning each other which obtains at the first convention of a new industry. With the section vice presidents, they form an executive board which is alive to the best interests of the Association and will give due attention to all.

Municipal Engineering adds its congratulations to the Association for the favorable outcome of its deliberations and predicts a large and ever widening influence for good as a result thereof.

THE ASPHALT SITUATION.

While the curtain has not been rung down finally upon the reorganization of the asphalt trust, the work has been completed so nearly that the present status of the question of sources from which asphalt may be obtained may be briefly sketched.

The following chronology from the "Newark News" gives the dates of the various steps taken:

March, 1899—An asphalt combine talked of.

June 28, 1899—Asphalt Company of America formed as primary holding company; incorporated July 6, 1899.

May 3, 1900—National Asphalt Company incorporated.

August 15, 1900—National Asphalt Company's charter amended to enable it to absorb the Asphalt Trust.

December 31, 1900—Asphalt Company of America purchased by the National Asphalt Company.

December 29, 1901—Receivership for the Asphalt Company of America and the National Asphalt Company.

Early in 1902—Bondholders of both the companies took action looking to reorganization.

July 18, 1902—Plan of reorganization is made public following report by Biddle and Harrity protective committees, respectively, for the Asphalt Company of

America and the National Asphalt Company.

March 19, 1903—General Asphalt Company formed to take over the broken combine.

May 15, 1903—Tangible assets of the Asphalt Trust bid in by the reorganization committee for General Asphalt.

December 22, 1903—Former Judge Kirkpatrick signed the order to sue for 80 per cent of the stock of the Asphalt Company of America, on motion of Receiver Tatnall, who reported that suits were prepaed to bing against the promoters which, it was expected, would realize $2,600,000 of profits, illegally secured through the exploitation of companies brought into the combine.

November 18, 1904—By order of the U. S. Circuit Court at Trenton, all Asphalt suits then pending were discontinued, and nothing was left to be done but hear the final report of the receiver and end the proceedings.

The charter of the Asphalt Company of America was dissolved on May 4, 1904, its assets having been disposed of to the General Asphalt Company.

The State of Venezuela took a hand in the matter in June, 1904, asking $10,000,000 damages from the trust for alleged aid given by it to insurrectionists in Venezuela.

The reason for the discontinuance of the suits against the promoters of the trust on Nov. 18, 1904, is undoubtedly to be found in the purchase at a comparatively high price of the small amount of securities remaining in the hands not consenting to the reorganization, thus leaving no one to contest its validity. The price offered for the last $12,800 of non consenting certificates is said to have been the largest amount to which they would have been entitled if the suit had been concluded and had resulted favorably to the non-consenting holders. The last preceding $30,000 worth of bonds were purchased at 54 per cent of their face value, of which 4 per cent represented the expenses of litigation. The consequent dismissal of the suits against the promoters for profits closes the way to official knowledge of the details of the transactions in the formation of the trust companies.

Application was made Dec. 30 for a receiver to wind up the affairs of the National Asphalt Company as an insolvent corporation, the assets of the company having been transferred to the General Asphalt Company some time since.

Until the contest with the State of Venezuela is settled the supply of Bermudez asphalt will be irregular and the General Asphalt Company will be restricted to the Island of Trinidad as its principal source of supply. The earlier combination dropped the Alcatraz asphalt properties from the active list of the trust.

The Philadelphia News Bureau sums up the situation in a general way as follows:

"The existence at this time of at least seventeen asphalt supply companies and about 154 asphalt paving companies and contractors competing with one another, except a few small groups, has brought about low prices and sharp competition which is the present status of the asphalt industry. The older companies have the disadvantage of a large amount of pavements to be maintained for long periods of time under the free guarantee given when the contracts were taken and such maintenance generally costs more than was anticipated and places such companies at an additional disadvantage under the newer ones. Experience counts for nothing at present in the asphalt industry as far as competition of one company against another is concerned because of the large number of trained asphalt workers who have been set adrift by the failure and shrinkage of old companies. Machinery and tools are not patented. Thus with plenty of good asphalts, experienced men and tools, it is at present an open industry with apparently no possibility of making any combination which can cover more than local areas in the different parts of each comtry where freights or other local conditions are favorable.

"One or two of the companies directed from Philadelphia, probably to protect themselves or try to earn profits not possible with asphalts, seem to be laying other kinds of pavements, such as brick, wood-block and a substitute or imitation of bitulithic pavement. This is like a house divided against itself or trying to serve two or more masters and reacts against the popularity of asphalt pavements. The bitulithic pavement, laid under patents owned by opponents, has made serious inroads against asphalt pavements to the extent of several mil-

lion dollars worth in many cities, which millions would otherwise have probably gone into asphalt treasuries. Considering the present state of the asphalt business its immediate if not final future seems to be along two lines: (1) to produce and sell high-grade refined asphalt to all consumers without regard to their relations one to another the same as Portland cements are sold to all consumers, for asphalt is the cementing material of pavements, etc., the same as Portland cement is of masonry, etc.; (2) for the paving companies to learn that they can work only in areas and with materials dictated by local conditions, especially of the cost of supply of not only asphalt, but the other important materials which enter into asphalt paving mixtures, etc."

The asphalt supply companies referred to deal in many brands of natural American asphalts from California, Utah, Indian Territory, Kentucky and in artificial asphalts from the petroleum of California, Texas, Indiana, etc. Some asphalt from Cuba and some rock asphalts from France and Italy also reach this country.

Mr. A. L. Barber, since his withdrawal from the trust, has interested himself in Mexican asphalt and has put limited quantities of it on the market with unlimited quantities in sight to supply the demand when it develops.

The reduction of asphalt to a staple article of commerce, open to the freest competiton, and the setting free by the trust during the past four years of many asphalt experts, should result in cheaper asphalt pavements of fully as good quality as those laid in the past. If this end has been reached, the losses due to the financial wreck of the asphalt combination will be largely recovered, not by the investors in the securities, but by the public at large.

FUEL AND CEMENT TESTING AT ST. LOUIS.

Some account of the fuel-testing plant at the St. Louis Exposition has already been given in Municipal Engineering. The plant is still in operation under a committee appointed by the director of the U. S. Geological Survey, consisting of Edward W. Parker, Joseph A. Holmes and M. R. Campbell. A plant for cement and cement products was operated by Mr. Richard L. Humphrey for a portion of the time at the Exposition. It is now proposed by the U. S. Geological Survey to add the cement testing plant to the fuel testing plant if the necessary appropriation can be obtained.

This proposition is one of much value to the cement trade. While we have had many opportunities to test cement and cement mortar so as to determine the relative values of cements and to a limited extent the relative values of the materials with which the cement is mixed, we have had but little opportunity to obtain the results of scientific tests of cement products, such as monolithic concrete, concrete blocks, reinforced arches, beams, floors, walls, etc. The few tests in these lines which have been made have only whetted our appetites for more. Our readers cannot do more for the advancement of the knowledge of the use of cement than to aid in the appropriation by Congress of sufficient money to operate this plant and install what additional apparatus may be necessary.

To the appropriation for the fuel-testing plant should be added authorization of tests of the methods of burning powdered coal for fuel. This seems to have been the only promising method of producing an economical process of combustion which was omitted in the original law under which the fuel-testing plant is now running.

THE QUESTION DEPARTMENT

STEEL BLOCKS FOR PAVING.

We should like to obtain from you some bibliographical particulars about all that has been published in the United States concerning paving blocks in steel or cast-iron as used in streets.

HENRY TURBEAU, Paris, France.

Municipal Engineering has had a number of articles upon the use of iron as a paving material. The following are among them:

"An Iron Block Pavement," vol. ix, p. 378, giving a description of a cast-iron paving block, patented in 1895, which, so far as any information has been received, has never been put in use.

"Iron Pavement Impracticable," vol. ix, p. 360, an answer to a question, which shows the reasons for failures of iron pavements in expense and slipperiness Iron curbstones are considered on the following page.

"Iron Pavement in London," vol. xxi, p. 416, showing reasons for failures of iron pavements laid in 1816 and 1856, which, though durable, did not wear evenly, and were certain to injure falling horses somewhat seriously.

Steel rails in pavements for wagon wheels are considered in vol. x, p. 48; xvi., p. 49; xvii, pp. 230 and 372. Reference may also be made to the "Business Directory," published in each number of Municipal Engineering under the heading "Steel Track Construction," for makers of such steel rail pavements.

ASSESSMENT OF COST OF STREET INTERSECTIONS.

The question has come up in regard to the issuing of tax bills around a square. It is contended that a portion of the intersection, one-quarter, should be assessed to the whole block cornering on the public square. Kindly inform us what is the practice.

A. J. B., Albany, Mo.

The problem seems to be to assess the cost of the intersections of the streets at the four corners of the public square, the paving contract apparently covering the four sides of the square and the street intersections at the four corners. We are informed that under the Missouri law governing cities of the third class, the whole cost of an improved street is charged to the property abutting on the improvement, the intersections being counted in with the streets and the total cost divided by the number of feet of property fronting on the street to obtain the assessment per foot front. In cities of the fourth class, to which Albany apparently belongs, the cost of each block of street is calculated separately, from the middle of one intersecting street to the middle of the next, and the cost of this length is assessed upon the property fronting on this block of street. This would seem to throw half the cost of half the intersection on the property in the next block of street in the square cornering on the public square. But the question immediately arises in the problem before us as to which is the street under improvement and which is the intersecting street. One block each of Main, Franklin, Tenth and Eleventh-sts. has been paved and their respective intersections. Should the one-half of the cost of the intersection of Main and Tenth be assessed on the next block of Main or on the next block of Tenth?

The problem is one for a lawyer versed in the Missouri assessment laws for cities of the same class as Albany.

In Indiana under the former Barrett law the cost of the full intersection of two streets was divided into four equal parts and assessed upon the property fronting on half the length of each block measured from the intersection, half on each side of the street. This will ultimately be equitable when the streets are all paved. In the case before us this would mean the assessment of one-eighth the cost of the intersection on half the length of the next block of each of Main and Tenth-sts. on the square cornering on the public square, and one-eighth on each of the other six half blocks of property frontage coming to the same intersection. The property on the unpaved portions of Main and Tenth-sts. would receive this amount of assessment in advance of any direct benefit,

but the property would doubtless receive sufficient indirect benefit to warrant this small assessment and in any event it would only be an advance assessment of a sum which must be paid whenever the street paving is extended in front of the property so assessed.

THE CLAYS OF NEW JERSEY.

I understand that there has been a report made and printed in the form of a pamphlet that treats of the several different kinds of clay found in the State of New Jersey that can be used in the pottery and firebrick business. Can you tell me if such is the fact, and where and how I can obtain it?

H.S., Chicago, Ill.

The U. S. Geological Survey, Washington, D. C., has published a monograph by Heinrich Ries on "The Clays of the United States East of the Mississippi River," which covers the ground described very fairly. It can be obtained through Congressmen or possibly direct from the Survey Office. It is "Professional Paper No. 11" of the Survey.

Dr. Ries has a paper on "The Refractoriness of New Jersey Firebrick," in the last volume of transactions of the American Ceramic Society, Edward Orton, Jr., Secretary, Columbus, O.

He has also made a full report on the clays of New Jersey, which can be obtained of the New Jersey State Geologist, Trenton, N. J. It is contained in vol. vi of the department's reports.

INFORMATION ABOUT MUNICIPAL OWNERSHIP.

Send me the back numbers of your magazine containing lists of articles pro and con on municipal ownership in vol. xxi, p. 163, and vol. xxvii, p. 273. I would be very glad of any other information you could give me as to any treatise on this subject. I have the Massachusetts reports, Francisco's book, the report of the Cincinnati Committee, the message of the Mayor of Boston, report of Atlanta Committee and one or two other pamphlets, but it may be that you can advise me of something new and recent, and if so I shall certainly appreciate it.

H. W. P., Asheville, N. C.

The lists of articles referred to are of articles in Municipal Engineering on the subject of municipal ownership and of books considering the question. Since the last list was published the following articles have appeared in vol. xxvii of this magazine, giving some information about specific cases: "The Municipal Ownership Question in Mason City, Iowa," p. 285; "Municipal Ownership in Santa Clara, Cal.," p. 294; "The Municipal Asphalt Plant at Winnipeg, Man.," p. 354.

Reference should also be made to the publications of statistics made by the U. S. Department of Commerce and Labor. "Public Policy" is a weekly paper published in Chicago which considers the problems of municipal ownership with strong bias toward the opinion of the editor that strict control of public service corporations is better than municipal ownership of the industries which they operate.

WATER RATES AND WATER CONSUMPTION.

Will you kindly inform me in what publication, if any, can be found statistics relative to water rates charged and the quantity of water consumed per capita for different purposes in a considerable number of cities of the U. S.

T. W. NOTTINGHAM, Seattle, Wash.

The "Manual of American Water Works" ($3) gives all the data desired for a majority of American cities. The latest edition is dated 1897, so that the information is not up to date in all cities, but will probably serve our correspondent's purpose.

COST OF MAKING AND LAYING CONCRETE BLOCKS.

The following is from a letter giving the experience of J. M. Ackerman of Albuquerque, N. M., in making and laying hollow concrete blocks in buildings. The prices for some of the materials are higher than in many parts of the country and the prices for labor are probably higher also, but sufficient detail is given to enable one to fit the resulting figures of cost to any prices of raw materials.

I came here with a Palmer machine and manufactured blocks 9x10x32. I got men to make these blocks at 5 cents per block. I put all material on the ground, tools, etc., to work with. Three men made from 100 to 150 blocks per day. Sand cost me 60 cents per yard or about 3 cents per block. Cement cost me $3 per barrel, and, making blocks one part cement and four parts sand, a barrel of cement will make twenty blocks. This makes your cement cost you 15 cents per block. I put the blocks from the yard to the building, which cost me 2 cents per block. I laid them in lime and sand, which cost me 3 cents per block, figuring lime 30 cents per bushel and sand 90

cents per yard. I lost about 100 blocks in 2,000, breaking in hauling from the yard to the building and cutting, as it is almost impossible to put up a building without some cutting. Putting in the wall 10 cents per block for lower story and 12 cents for upper story. You can figure on a little extra cost on water tables, sills and lintels, as they ought to be made one part cement and two parts sand. Summing up the above is as follows for one block:

Cement	15c
Making	5c
Sand	3c
Carting from yard to building	2c
Lime and sand for laying	3c
Putting in the wall	10c
Loss in making and cutting	1c
Total	39c

I had to compete with brick at $10 per thousand in the wall. So you can see the margin is too close for cement blocks in this town.

I will work for any company and guarantee the above figures where common labor can be had at from $1.50 to $2 per day, and materials at prices named above.

Another correspondent, J. L. H. B., of Batavia, O., gives the following as his first experience.

I wish to give my experience in laying concrete blocks for the benefit of A. T. B., who reported in the January number of your valuable magazine as to the excessive cost in his city.

This was my first job and the building is a farmhouse, situated about four miles from our town. And the men went back and forth to their work, sometimes arriving a little late. We aimed to work nine hours a day. The building contains 2,860 square feet surface, including openings, and is 20 feet high (two stories).

The blocks used were 8x20x10 inches, each block making 1 1-9 square feet. And the cost of labor, cement and sand was 6 cents per square foot.

We used the joist for scaffold. If A. T. B.'s blocks could be put in the wall at the same rate per square foot they would cost 8 cents each for laying.

I believe I can lay another job of the same character for 5 cents per square foot. J. L. H. B., Batavia, O.

DUTIES AND SALARY OF CITY ENGINEER.

Our city has under contemplation the drafting of an ordinance establishing the office of city engineer with a fixed salary instead of paying for each separate piece of engineering according to time taken. Can you give me any information as to where I can get a copy of an ordinance regulating the duties of a city engineer? Can you also inform me as to about what salaries city engineers receive in cities of 5,000 to 10,000 inhabitants?

C. M. T., ——, Mont.

The average city council in cities of the size named does not consider the question of qualifications of city engineer sufficiently to prepare a suitable ordinance governing the office. Many cities do not have any definite ordinance, putting the city engineer in the list of appointive offices usually, and making him simply the clerk or the executive officer to carry out the orders of the council or the council committees. This is not conducive to good work, even with a good engineer, for if the engineer runs too much against the wishes of the councilmen he will lose his position and few engineers in small cities are in position to do this with equanimity.

An ordinance governing the City Engineer's office should carefully separate the legislative portion of public improvements from the administrative, retaining the former strictly in the hands of the council and turning the latter over unreservedly to the engineer. The council should determine what improvements should be made, acting in accordance with the wishes of the citizens as nearly as the conditions will permit. The engineer should supply full information concerning different methods of making the desired improvements and the cost of the same, as a basis for a choice by citizens or councilmen or both of the particular method to be adopted. When the adoption is made the work of designing details and superintending construction should be put in the hands of the engineer and beyond the power of councilmen to interfere, except in the way of offering advice.

There should be some method of determining the qualifications of a city engineer, so that the council, which is not expert in these matters, will not be misled in making its appointments and find itself in possession of a city engineer who is not qualified for the independent action required, but can really serve only as the clerk of the council committee. This portion of an ordinance must be made up according to local circumstances. There is now no general method in vogue, but the rapid spread of engineering education will soon demand something of this sort.

It is difficult to fix a regular salary for city engineer in small cities. Some years he would not earn $500, while in other years he should receive $2,000. In general it may be said that salaries for competent men in cities of 5,000 to 10,000 inhab-

itants vary from $800 to $1,200 with a good many below the lower figure and a few above the higher figure. The competent men at less than $800 can only be obtained in case they have other work which supplements the compensation received from the city.

If the ordinance combines the offices of city engineer and street and sewer superintendent in one man the salaries can be combined and a better man can be obtained than if the offices are divided. This is a true economy. If the city owns its water supply or electric light plant a further consolidation can be made which will nearly always work to advantage.

These suggestions for an ordinance governing the city engineer's office will not be found in full in any existing ordinance, though all the provisions will be found in ordinances in various cities. A trial of the combination is strongly recommended.

Will our readers among the city engineers send us the ordinances governing their offices for comparison with each other?

MUNICIPAL MATTERS IN COURT

Higher Courts—Mankato Asphalt Injunction—Buffalo Viaduct Case—Duluth Paving Contract.

Abstracts from Decisions of the Higher Courts of Interest to Municipalities.

By R. H. Sullivan, Indianapolis, Ind.

When a City May Contract for Lighting the Streets—Providing a system of lighting for the streets of a town is a necessary expense for which a debt may be contracted and bonds issued without submitting the proposition to a vote of the people.—Davis vs. Town of Fremont, 47 S. E. (N. Car.) [illegible]

Excavating a Tunnel with Dynamite—A city is liable for the negligence of an independent contractor in excavating a tunnel with dynamite, the work being inherently dangerous and subject to the inspection of the commissioner of public works.—City of Chicago vs. Murdoch, 72 N. E. Rep. (Ill.) 46.

Collection for Work Done Under an Invalid Ordinance—In Chicago an ordinance is valid which authorizes the payment of a street improvement assessment where the work was done in good faith and in a competent manner, but under an invalid ordinance.—City of Chicago vs. Sherman, 72 N. E. Rep. (Ill.) 396.

Danger from Electric Wires—A city owes to its citizens the duty of protecting them against electricity, with which wires on poles may be charged, the falling of the wires and poles and the obstruction of the public highway.—City of Ft. Smith vs. Hunt, 82 S. W. Rep. (Ark.) 163.

Reassessment Barred by the Statute of Limitations—A reassessment for a municipal improvement must be made within the time prescribed by law or it is invalid.—Doremus vs. City of Chicago, 72 N. E. Rep. (Ill.) 403.

Failure to Complete Contract—When contractors agree with the city to construct a sewer system, but when a portion of the contract is completed they abandon and refuse to complete the work they are liable to the city in damages for failure to complete the contract.—City of Winona vs. Jackson, 100 N. W. Rep. (Minn.) 368.

Contractor Not Liable When Work Is Done in Proper Manner—A contractor engaged in laying a water main in a city street is not responsible to a property owner for the consequences of a necessary disconnection of a private drain running into the street, where the work is done in a careful, proper and lawful manner. Nor is he responsible for injuries resulting from extraordinary and

unforeseen circumstances such as unusual rains.—Bennett vs. Incorporated Town of Mt. Vernon, 100 N. W. Rep. (Iowa) 349.

Contractor Liable and Not the City—Where a contractor agrees to build a sidewalk for a property owner and does so in a negligent manner resulting in an injury to a pedestrian, the contractor is liable in damages and the city cannot be held unless it had sufficient notice of the defect.—Thompson vs. West Bay City, 100 N. W. Rep. (Mich.) 280.

When City Is Liable for Acts of Policeman—A park policeman employed by the Board of Park Commissioners stretched a rope across a park boulevard and a bicycle rider attempting to avoid it collided with a team, receiving injuries Held that the city was liable in damages.—Kleoppert vs. City of Minneapolis (Minn.) 669.

Injuries on Sidewalks—A city is not liable for injuries to a pedestrian caused by the cane with which he supported himself going through a crack between two decayed boards, where the sidewalk was in reasonably safe condition for pedestrians not compelled to use canes.—Harden vs. City of Jackson, 100 N. W. Rep. (Mich.) 389.

A Contract Does Not Preclude a License Fee—Contract between city and electric company providing for the erection of poles by the latter in the streets does not prevent the city from afterward exacting a license fee for each pole erected.—City of Ft. Smith vs. Hunt, 82 S. W. Rep. (Ark.) 163.

Injunction Against Mankato Asphalt Contract Sustained.

The Supreme Court of Minnesota rendered a decision recently in the case of L. Patterson and others vs. the Barber Asphalt Paving Company and the city of Mankato. The action was to determine the validity of a contract between the city and the Barber Asphalt Paving Company and for an injunction restraining and enjoining the asphalt company from paving Broad-st. under the contract, and the city from incurring any indebtedness on account of the same. Part of the work contemplated by the contract was performed and the balance, after the commencement of the suit, was abandoned and the contract canceled by the mutual consent of the parties. The asphalt company brought suit against the city and the action is now pending in the United States Circuit Court, to recover for the part of the contract performed, in which the city is defending and resisting its liability. The court holds that (1) the plaintiffs have the right to continue the prosecution of the action for the purpose of having determined the validity of the contract, (2) that the facts disclosed by the pleadings do not bring the case within the rule that where it appears in an action for an injunction that a change of circumstances after the suit is commenced renders an injunction unnecessary, it will not be granted, and (3) that the pendency of the action in the United States Court is not a bar to this action.

An opinion accompanies the decision in which the court says:

We are of the opinion that the order appealed from should be affirmed. The only question now before us is whether, in view of the conceded facts, there remain any disputed questions under the pleadings to be litigated. Counsel for appellant invoke the rule that, where it appears in an action for injunction that there is a change of circumstances after suit is commenced which renders the injunction unnecessary, it will not be granted. But the case does not come within the rule. The original action was brought against the asphalt company as sole defendant, and the relief demanded was that defendant be restrained and enjoined from performance of the contract with the city for paving that portion of the street in question which abuts upon plaintiff's property. Neither the city nor its officers were parties to the action, and the validity of the contract, though in a measure involved, was not the primary object of the action, except in so far as is involved plaintiff's property. By the supplemental complaint, however, the scope of the action was broadened; the city and its officers were made parties defendant and the relief demanded was that the contract be adjudged a nullity, because of irregularities in the proceedings leading up to its execution; that the defendant asphalt company be restrained and enjoined from performing the same and other relief similar to that prayed for in the original complaint, and generally for such other and further relief as might seem just and equitable. It may be that the action was limited originally to the rights of owners of abutting property, but by the supplemental complaint they not only bring their action as owners of property abutting the street in-

tended to be improved by the contract with the asphalt company, but as general taxpayers, and the relief demanded is that the contract be adjudged invalid, and that the city and its officers be restrained and enjoined from making any of the citizens of Mankato in any manner liable for the expense of the proposed improvement. The mere fact that the contract has been abandoned, so far as it relates to the partion of the street fronting the property owned by plaintiffs, and that the city council has canceled the contract as to that portion of the street is not fatal to plaintiff's right to continue the prosecution of the action. A large part of the street was paved and the contract performed by the asphalt company, and, if the contract be held valid, the city would be liable for the debt thus incurred, which can be paid only by a general tax levy on the property of the residents of the city. At the time of the commencement of the action plaintiffs had a good cause of action, and still have, for the purpose of having determined the validity of the contract. If they succeeded in establishing its invalidity, they would be entitled to an injunction restraining the city authorities from paying the indebtedness incurred thereby, either by a tax for that purpose or otherwise. It is immaterial, too, that the city is now contesting its liability in the United States Circuit Court. The jurisdiction of the United States Circuit Court and that of the State Courts is concurrent; an action may be pending there, and also in the State Court, involving the same questions, and neither be a bar to the other.

Our conclusions are in harmony with those of the trial court, and its order in the premises is affirmed.

Retrial of Buffalo's Perry Street Viaduct Case Ordered.

The Court of Appeals at Buffalo, N. Y., has reversed the judgment of the Appellate Division in the suit brought by the Erie Railroad to restrain the city of Buffalo and the Grade Crossing Commissioners from letting contracts for the construction of a viaduct over the Erie's Perry-st. tracks, at a cost of $150,000. The Appellate Division decided in favor of the city, and now that this decision has been reversed, the suit will be sent back for retrial.

The railroad company claimed two years ago that under its contract with the Grade Crossing Commission, it was expressly agreed that the construction of this viaduct should not be undertaken until all other grade crossing work affecting the Erie was completed, and then not until after a hearing upon the question of the necessity for building the structure. The railroad company claimed a breach of contract in both particulars. In the intervening period since this proceeding was instituted most of the other work affecting the Erie road has been completed. The railroad company contends that a costly viaduct is not warranted in the vicinity of Perry-st., and the Grade Crossing Commission will now have to determine the necessity in the case.

A Duluth Paving Contract Declared Void.

An opinion has been handed down by Judge Cant of the District Court at Duluth, Minn., in which he holds that the contract of the city with the Barber Asphalt Paving Company for paving Superior-st., between Eighth and Sixteenth-aves., east, is null and void. During 1903 the street was paved at a cost of $54,760. Some of the taxpayers objected to the payment of money by the city on the contract, claiming that the city's permanent revolving fund for purposes of improvement did not contain enough money, after all proposed improvements were deducted, to pay for the asphalt paving. The city was enjoined and Judge Cant upholds the contention of the taxpayers. The case will probably be carried to the Supreme Court.

WATER WORKS

Water Filtration Progress—Water Meters in Duluth and St. Paul.

Progress in the Filtration of Public Water Supplies.*

By Charles Prosemann, jr., Indianapolis, Ind.

Closely following the march of civilization are conditions which arise from the congestion of people and nothing is more marked than the improper or faulty sanitary arrangement of a great city. The lack of proper sanitary precaution has caused the loss of thousands of lives to many populous districts, and in almost every case we find the lesson well learned after an epidemic of any kind. In the sparsely settled areas the surface waters can be used in their natural condition for domestic purposes without fear, but as a community becomes more populous and its environments become settled, we find the rivers and water bodies used as carriers for sewage and the manufacturing wastes of various works, which contaminate the water and render it unfit for use. In fact, the very existence of large bodies of water, or rivers, signifies a population of some density in their immediate vicinity, which is conducive to contamination and renders the character of the water questionable for domestic purposes. No running stream can purify itself of sewage matter in any quantity during the flow of a few miles, and, while nature is a kind mother, to believe that such purification can take place is trusting in a Providence which cannot revise its own law.

Filtration of water for domestic use has long been practiced, but it is only in late years that the subject has been put on a scientific basis. Formerly chemical analyses were the criteria for judging water and it was supposed that the filter, which made little change in the chemical constituents of the water, would make little change in the number of bacteria. In fact, the first filters of any prominence were simply intended to clarify the water. At that time the science of bacteriology was unknown and no attempt was made further than to give a water which would be clear and sparkling to the eye. There seems to have been little confidence in the first filters, except for the above use, and as the chemical analysis showed little improvement after filtration it was assured that the very minute micro-organisms would not be held by the filter bed. The introduction of Koch's water examination by the gelatine process gave a new aspect to this work and showed the efficient work by filtration in the reduction of micro-organisms, giving an efficiency generally above 98 per cent. Thus, a new impetus was given water filtration and biological investigations have proven its great usefulness from a sanitary view. The development of bacterial analysis, consequently has made a great change in the standard of purity of water used for domestic purposes. Formerly the chemical standard prevailed, and now a bacterial purity is required; as, for instance, that by the German government, which insists that over 100 bacteria per cubic centimeter shall not be exceeded.

Filtration has thus been placed upon a comprehensive and scientific basis, and an interesting development in purification methods has taken place rendering the modern filter a reliable and safe barrier to the contamination of a public supply. Probably no instance more striking than the Hamburg-Altona cholera epidemic in 1892 could be cited to show the effectiveness in checking disease by filtration. Altona whose thoroughfares start where those of Hamburg end; drawing its water supply from the same stream, the Elbe, which received the sewage of 800,000 population from Hamburg, had a death rate of 221 per 100,000, while Hamburg using unfiltered water taken above both cities shows a death rate of 1,200 per 100,000. Hamburg's supply to start with was comparatively pure compared to that of Altona, but Altona's water was given careful filtration through slow sand filters before delivery.

Methods of Purification—Let us glance at the various methods of purification of water and we find distillation, oxidation, or aeration, subsidence, straining, precipitation and filtration. These are all natural methods with the exception of precipitation by chemicals; and we find nature practicing these methods on a large scale. Commercial Water Purification as practiced at the present time resolves itself

*From a paper before the Indiana Engineering Society.

into two methods; Slow Sand Filtration and Rapid Mechanical Filtration.

Mechanical Filtration—The mechanical method of filtration is a process long known in a primitive way to the Chinese and ancient Egyptians, and consists of using alum or some form of coagulant to precipitate the suspended matter and organisms to form the filtering media.

The raw water in flowing to the filter is treated with a coagulant of some form, sulphate of alumina being most commonly used, which for its operation is dependent upon some base in the water, such as lime. The sulphate of alumina is decomposed into sulphuric acid and alumina. The sulphuric acid combines with the lime or base in the water, while the alumina forms a precipitate which entangles the suspended particles and settles on the surface of the sand bed. The action of the sulphate of alumina is analogous to the clearing of coffee by the white of an egg. At times, however, the base in the water is not present in sufficient quantities to combine wholly with the sulphuric acid; in this case, unless a sufficient quantity of the base be added to the water, there will remain in the effluent a surplus of sulphuric acid. It is therefore necessary that the coagulant be applied in proper proportion to the water, and that the water be in condition to receive the treatment.

Slow sand filtration. It is seen that the distinctive feature of the mechanical filter is its rapid rate of filtration. Directly opposite in this respect is the system of slow sand filtration, whch is operation is the same method as employed by nature in the purification of water. The first filter of this kind was built in England in 1829 by James Simpson and since that time this method has been most extensively used in the filtration of large volumes of water. The first filters of this type were not constructed with a further view than that of clarification, but subsequent investigation proved them most effective in resisting the passage of micro-organisms.

These beds consist of a water tight reservoir, upon the bottom of which are placed collecting drains for the water. These are covered with a stone sub-base, graded from large stone to a size that will support the sand. The sand being placed upon the base from a depth of 3 to 4 feet. Water is admitted over the sand to a depth of about 3 feet and passing through the bed at a rate of 3 to 4 million gallons per acre per day is taken out through the collecting galleries. The efficient sanitary work of the filters is not done altogether by the sand itself, but largely by the gelatinous membrane which covers the bed in a few hours, the greater proportion of impurities being retained at or near the surface of the bed.

The grains of sand closely packed may be said to resemble many minute basins or cups, which assist in forming the "Schmutz Decke" or dirt cover, much the same as dirty water in a cup deposits the sediment upon the sides. After a period of three to six weeks, dependent upon local conditions, the filter becomes clogged and the gelatinous cover is removed. A depth of ½ to 1 inch being taken off, when the filter is again ready for use.

Types of underdrainage. An examination of the underdrainage system of various beds is of interest and the following sketches show a number of different methods of construction.

A puddle lined reservoir with large stone collecting drains, is used at Dublin. These drains are laid with open joints.

In another filter the collectors are built up of perforated brick, these drains being spaced a few feet apart and discharging into a common clear water conduit. In another the small drains are square tile, perforated through the sides and discharging into a large collector. The tile being spaced as in the preceding figure.

Another filter uses an arched tile underdrain, the tile running into a separate clear water gallery built up of walls and covered on the top. This construction was recommended by Kirkwood in 1869 for the city of St. Louis.

The tile used in the Indianapolis filter beds is somewhat similar to the last two mentioned, being a square tile with perforated top. They are, however, placed differently, being in juxtaposition, while the others are spaced a short distance apart.

The type of construction designed by the writer for Algona, Iowa, is a triangular-shaped tile with a side opening for the admission of the water, the tile covering the entire bed. A modification of this tile was designed and is being considered for the Wilmington (Del.) plant. These last two tile, owing to the triangular shape, allow a saving in the stone sub-base beneath the sand.

Saving in Stone—One of the most noticeable changes seen when comparing the older bed with the latter-day type is the great saving in the stone base sup-

porting the sand, the former in some cases being as thick as four feet, while the most modern beds use 12 inches and even less. With stone or gravel at $1.50 per cubic yard each foot in depth represents 1,600 cubic yards, or $2,400, for each acre of bed. The saving of stone alone in the modern bed is considerable when the plant is large.

Regulation—An important feature of the slow sand filtration bed is the means of regulation of the influent and effluent water. The water over the sand bed should be kept at a constant level, obviously, to give a constant head for filtration, and the effluent as well should be without fluctuation.

Many of the early types of filters were simply equipped with a gate valve for the admission of water. The balance valve is used in Philadelphia and is a modification of the one installed at Berlin and is now in universal use. Another modification of the balanced valve was designed for the Wilmington (Del.) plant. A valve for a smaller plant designed for the writer for Algona, Iowa, is made of standard tees. The cost is reduced to a minimum.

The development of effluent regulation has kept pace with the other details of construction. In one type of effluent valve by means of the threaded shaft attached to the telescopic weir, screwed through the arms fastened to the circular float, the weir can be submerged any distance below the surface of the water, giving the required rate of filtration; at the same time allowing the telescopic pipe a free downward movement to take up the loss of head as the filter becomes clogged. Generally the standard above this has a recording dial giving the flow in gallons for different depths of submergence of the weir.

Venturi meters are also used on most plants with a recording apparatus to give the flow during the day. The necessity of these devices can readily be seen as the quality of the effluent is likely to be affected by marked differences in the head of the water above the sand or by fluctuations in the effluent.

Sand Washing—One of the large items of expense in the maintenance of slow sand filters has been the removal of the dirty sand and its subsequent washing and replacing. When a filter is ready to be cleaned the water is allowed to subside in the sand bed until the surface will bear the weight of a man. The "Schmutz Decke," or dirty sand layer, is then shoveled off to the proper depth, generally from ½ to 1 inch, and placed in piles conveniently spaced. Formerly the sand was wheeled away in barrows and washed. The operation was slow and expensive. A later improvement was a box with a perforated bottom, through which the water was allowed to flow upward with a light head, the sand being placed above and stirred, the dirty water overflowing at a suitable opening.

Following this are a number of other machines for doing this work, the most efficient of which was one made by Korting Bros., England. This consists of several conical hoppers, at the bottom of each being a Korting ejector, the sand being placed in the first hopper and mixed with water. This is then conveyed by the ejector over a rectangular board with riffles and drops into the next hopper, the operation being repeated as many times as there are hoppers. The dirty water overflows at the side of the hopper and the sand is finally discharged well cleaned of its impurities. About 60 pounds water pressure is necessary at the ejectors. The volume of water used is about fourteen times the sand volume.

A washer designed by the writer embodies the Korting ejector, but having half way up in each hopper an annular ring discharging a number of downward tangential jets into the sand. This produces a swirling motion to facilitate mixing the water and sand, which is then discharged through a Korting type of ejector above two circular riffle boards arranged one below the other. The sand and water flowing over these is dropped into the hopper below, where the operation is repeated.

The distinguishing feature of this washer from the former type is in the swirling nozzles and the riffle boards, the latter having ten to fifteen times the linear riffle surface over the older type.

The former method of taking the dirty sand from the bed was entirely by wheelbarrows, a slow and tedious operation. The most modern method is to use a small portable ejector which can be easily handled by two men. This is carried into the filter bed and the inlet of the ejector connected to a pressure supply pipe or hose and the outlet connected to a discharge pipe or hose, the stream of water being started, the sand is shoveled into the hopper and conveyed outside the filter bed to the sand washers. Thus the only necessary manual labor connected

with the operation is in shoveling the sand into the hopper. A pressure between 60 and 100 per square inch is used for the stream of water. With this machine the work of ten men can be accomplished.

Probably close to one-half the washing is done by the ejector in transporting the sand to the washers. An interesting comparison is the cost of washing between the old box method and the ejector method. Figures for the former given from an English plant show 12 cents per cubic yard, while the latter cost at the Lower Roxborough plant, Philadelphia, was 8 cents per cubic yard, filtered water for the English plant being given at $1.50 per million gallons, while for the Philadelphia plant $1.06 is given. The figures given are for water used.

Preliminary Filtration—For the treatment of waters which are more or less turbid and are to be filtered by the slow sand system, it is sometimes advisable to use preliminary filters to take out the bulk of the particles in suspension. This allows the main beds to be kept in use a longer period between cleanings. A number of different types of preliminary filters have been constructed, but all results as yet seem to be tentative. It may be of interest to mention the preliminary filters being constructed at the Roxborough plant at Philadelphia. These filters consist of a concrete steel tank, in which is placed five inches of coarse gravel from 2½ to 1½ inches in size, 10 inches of furnace slag from 1½ to ¾ inches, 24 inches of the same material from ¾ to ¼ inch, and above this about 9 inches of sponge, compressed on the layer of slag by means of narrow planks, above which are placed timber beams running lengthwise in the filter tank, the beams being held in place by screw jacks braced against I-beams transversely anchored in the filter walls. The water is introduced through perforated tile pipes placed on the floor of the filter, and filters upward through the gravel, slag and sponge, being drawn off at the top of the filter through a weir, thence being delivered for the final filtering.

These preliminary filters operated at a rate of 46.5 million gallons per acre per day. The slag layers are flushed from the bottom. When the sponge becomes clogged it is mechanically removed and washed by machinery.

In the preliminary filters contemplated for the Belmont plant at Philadelphia the water filters downward through a bed of sand 30 inches deep at the rate of 80,000,000 gallons per acre per day. The sand, has an effective size of 0.5 m. m. and a uniformity co-efficient of 1.5 to 2. Below this sand is placed a 5-inch gravel underdrain, ranging in size from 2 inches to 1 inch in diameter. A collector is placed in the center of the bed for the filtered water. The filters are washed by a reverse current, which overflows into adjustable troughs above the sand bed.

Efficiency—The modern filter of either type, when correctly installed and capably managed, has shown an efficiency which cannot be questioned. Taking for example the magnificent plant at Philadelphia, which when completed will probably be the largest of its kind in the world. These beds average an efficiency of about 98 per cent in the bacteria removed, and often above 99 per cent. In fact, the bacillus coli communis is rarely found in the effluent of the filters, while tests generally show it prevalent in the applied water, even under the best conditions of the river, and while the majority of the bacteria found in surface waters are not harmful, it is, of course, necessary to remove these, as well as pathogenic organisms, as it would be impossible to remove only those which contaminated the water from sewage pollution.

Plants of any magnitude, using badly polluted water, should have both the influent and effluent waters examined at regular intervals. Any great fluctuation in the number of bacteria in the effluent would give warning of danger, that would be of service in arresting an epidemic. Investigations after an epidemic generally give little information as to the conditions prevalent at the time of the outbreak.

Individual Examination of Waters—In the selection of filter to suit local conditions, it is needless to say that many items must be considered, and the topographical conditions as well as the biological conditions of the water should be investigated. It is generally conceded that while both types of filters do efficient work, for waters of high turbidity and low in micro organisms, the mechanical type has been generally used, while for those waters highly contaminated with organic impurities and a moderate turbidity the slow sand system has found more favor. However, each water should be individually considered, as no two are the same, and while one plant may be

successful in the treatment of a water, modifications, or, perhaps, altogether different treatment may be necessary for another water. It is therefore necessary to make a preliminary examination for each case.

There is little doubt that the development in filtration works has done much toward the elimination of zymotic diseases and the suppression of epidemics, and as the people become more and more aware of the danger of sewage pollution they demand the purification of waters which hitherto they looked upon as potable and safe. The necessity of water purification becomes the more apparent as a community and its environments increase and there are few waters that can not be rendered safe and palatable after applying the proper method of purification.

The Water Meter Question in St. Louis.

The request of the manufacturers of the city of St. Louis, Mo., for reduced water rates has developed the fact that there are only 50 meters in use in that city, although the city has nearly 75,000 water taps. The manufacturers argue that meters are not in general use among manufacturing concerns and that favoritism is the cause.

Manufacturers have the choice of two systems—the rate schedule, which requires the meter, and the flat rate. The meter measures all water used and bills are rendered accordingly, the rate to manufacturers being 1¼ cents for 100 gallons. The flat rate is figured out on the basis of $2 for every individual employe in the concern with extra tariff for water used in boilers, toilet and bath rooms. Assistant Assessor of Water Rates Specht estimates that it really costs a manufacturer more for water, according to the flat rate than it would if he had a meter and paid for only what he used at 1¼ cents per 100 gallons. Mr. Specht figures out that all manufacturers who use the flat rate pay 3 cents per 100 gallons on a general average for water. The Manufacturers' Association contends, however, that it can cite cases of manufacturers who use the flat rate and pay for fifteen employes when they really have as many as 100 men on the payroll. Mr. Specht admits the probability of such cases and says that the collection department has to accept a man's affidavit when the list he furnishes is questioned.

Mr. Specht estimates that it will require fully $1,000,000 to equip the entire city with meters. He says there can never be an equitable adjustment of rates until meters have been established throughout the city.

Water Meters in St. Paul, Minn.

In his annual report to the Board of Water Commissioners of St. Paul, Minn., Dec. 31, Secretary Caulfield showed that during the year a total of $22,161.06 was collected, which is $10,400.42 in excess of the receipts of the previous year. This increase resulted largely from the use of water meters. During the year 782 meters were installed, making the total number in use in the city 7,909, of which 122 are owned by the consumers and the remainder by the city.

ROADS AND PAVEMENTS

Brick Pavements—Good Roads in Pennsylvania—Japanese Army's Good Roads—Pavements of Binghamton.

Brick Pavements.*

By John W. Fulwider, City Engineer, Lebanon, Ind.

Prefatory to a discussion of the subject proper, some views will be presented relative to highway construction. All permanent highway construction in my county (Boone) has been of gravel, being so remote from quarries as to make macadam roads impracticable. They have been constructed during the past 25 years. In all that time, there has been no progress in the line of better construction. In a fit of misguided and false economy,

*A paper before the Indiana Engineering Society.

no attention has been given by engineers to sub-drainage. Side ditches have been constructed at haphazard, regardless of drainage. As a result, pools stand by the wayside after every rainstorm. In the spring, unless there has been an exceptional winter, the graveled highwas are cut full of ruts. These are filled annually, by road graders and with coatings of gravel (mostly sand), at an enormous expense. Much of this could have been saved by adequate sub-drainage and proper construction of side ditches.

Until the authorities recognize that it is better to put more money into first constructiton and a plan is devised for systematic repair, the almost criminal waste will continue. The railways, having the management of their rights of way, have shown us the way. It would be economy to follow.

In the matter of street construction, the question of drainage has been neglected in a much less degree. However, there is room for improvemeent. Good sub-drainage adds but a trifle to the cost, and should never be eliminated from the plans of a permanent pavement. The tax payer is beginning to see that it does not pay to construct a gravel or macadam street, and is becoming favorable to the best. It is the opinion of the wr'ter, that only brick pavements should be recommended for the small cities. Properly constructed, with a systematic plan for cleaning, there can certainly be no objection, except as to noise, as compared to any other form of construction.

That is not the bugaboo that has been claimed by some. Rather, it becomes in a short time one of the features of one's existence, and is only noticed when taken away. A brick pavement is certainly sanitary, when the interstices are properly filled with cement grout.

For years, as it was the best material available, sidewalks were constructed of the ordinary building brick and some in recent years of vitrified block. It is fortunate that the tendency now is to discard both. They cannot be maintained to the original grade, puddles of water stand over them after rains, the grass and weeds grow up between them even on much frequented streets, and they afford a lodging place for disease and dust. They add nothing to the beauty of the adjacent homes and the street. At but little more cost a cement walk can be constructed that will eliminate these undesirable features and at the same time add very much to the beauty of the street.

In the construction of a street this year in a residence district the writer recommended a paved roadway of twenty feet cement walks five feet in width, with a space of one foot between the walk and property line. The entire width of the street is sixty feet. It was so constructed. The crown of the street is identical with the curb grade, with a gutter four inches in depth at the curb line. A level intersection was constructed at street intersections, having six inlets set two feet from each property line and connected with a ten-inch storm-water sewer. A six-inch field tile drain was constructed the entire length of the improvement two feet below sub-grade.

A ten-inch gravel base was used and brick slushed with a cement filler. The plan for a level intersection gave general satisfaction. A six-inch curb was constructed.

While there was much criticism of such a narrow roadway, there is much less than there was and time, I feel, will prove its wisdom. It diminishes the first cost, is sufficient for its purposes and the repair, cleaning and sprinkling expenses will be lessened.

It also gives a much larger park-way, which will provide an opportunity for a "Civic League," recently organized, to demonstrate its ability in the line of street ornamentation. With so slight a crown, which is certainly ample from the standpoint of drajnage, every foot of the pavement can be used to the curb line, in fact affording a practically wider roadway, than others we have that are wider in fact, but have so great a crown that a space of three feet on each side of the street is rarely used by vehicles.

The plan of intersection is certainly the best that could be devised for foot-passengers, and being level, there is no danger of horses slipping in turning from the intersecting street going at a rapid gait,

Our experience is that a concrete base is the best foundation for a brick pavement, 4 inches in depth being ample for streets in the smaller cities. Although much depends upon the judgment and discretion of the engineer in getting the best type of improvements best suited to the needs and topography of our smaller cities, still the interest and intelligence of the citizens is a most important factor. The organization of Civic Leagues, if their efforts were unremitting, and not spasmodic, as now, would do much to add to the appearance of our city, streets and alleys. Flowers, trees and ornamental shrubs, when intelligently set, can make

a thing of beauty of a most uninteresting street.

City authorities would not permit many unsightly piles of rubbish to be undisturbed, if there were a quiet persistent organized force criticising and attacking their neglect. While striving for better pavements, compel also cleaner ones.

The Good Roads Movement in Pennsylvania.

In his annual report to Governor Pennypacker of Pennsylvania, Highway Commissioner Hunter says that the workings of the State Highway Department during 1904 have been very satisfactory. The last Legislature appropriated $6,500,000 to be expended in six years, as provided in the Sproul Good Roads Bill. Among the number of recommendations made by Commissioner Hunter, he suggests that all applications for road improvements be filed with the department by May 31 of each year and that money appropriated to counties in the previous year and not applied for be apportioned to the counties that have an excess of applications for the current year; that the department be authorized to make complete measurements of the roads in all the counties in the State; that legislation should determine what should be taken as county bridges and what township bridges; that the work of making the preliminary surveys and plans should be done by the department and not by county surveyors; that the office force of the department should have at least six more civil engineers. Commissioner Hunter also recommends that in order to have a better system of supervisorships, a board of three such officials in each township, one to be selected each year, be appointed. He also recommends that it be made a misdemeanor, punishable by a heavy fine or imprisonment, for drivers to injure roads by the use of rough ice or drag locks, or by plowing a gutter alongside the macadam with a heavily loaded wagon or otherwise. Also, that narrow tires on heavy wagons shall be abolished as soon as possible.

During the year 1904 9.25 miles of road were constructed. There is under construction 32.44 miles of good road and under contract 27.30 miles of road. Bids have been received, but the contracts not yet let, for 33.57 miles. There is under advisement and the advertisement of bids directed for 24.86 miles and advertisement requested, but the county commissioners refused to publish, for 3.12 miles, making a total in all the items of 120.54 miles of road in one year.

Japanese Army Builds Good Roads.

One thing for which both Korea and Manchuria are indebted to Japan—twice over during the last ten years—is the construction of fine highways wherever the army has moved. No appropriation is ever made out of the taxes for the repair of the main thoroughfares in either of these countries, and hence, in the course of years the roads become badly cut and waterworn and during the rainy season are practically impassable. While the Japanese have not metalled the new roads which they have been steadily building from the time they left Seoul, they have at least by banking the centers and ditching the sides, insured the possibility of constant traffic over them, even during the rainy season, and their labor will leave an impress for several years.

Where (as is often the case) the old road has been worn by travel and water into a deep, narrow V-shaped gully, the new work takes a fresh course, often through the newly plowed fields of the Chinese farmers, and where lowlands or bogs existed, the roadway is often deflected to the well drained foothills. At places where the defensive idea is paramount, the various positions are so connected as to secure the greatest ease of communication and mobility in placing troops.—Leslie's Weekly.

The Pavements of Binghamton, N. Y.

In his annual report to the Mayor and Common Council, S. M. Baird, City Engineer of Binghamton, N. Y., states that brick paving only was laid during the last year, as follows: Susquehanna-st., $1.87 a square yard; South-st., $1.73; Clinton-st., $1.85. Total cost, $24,200.79. The Toledo Construction Company was awarded a contract on April 19 for repairing 13,220.58 square yards of asphalt pavements for $12,954.85. Of this 1,250.93 square yards is charged back to the parties causing these excavations from different causes, amounting to $2,076.57, leaving the city's portion of the cost $15,031.42. The city now has 10,869 miles of pavement in use, consisting of asphalt and brick paving. The highest price paid for Trinidad asphalt was $2.80, and the lowest $2.43 a square yard; Alcatraz, $1.59 a square yard. Total cost, $310,983.92.

PUBLIC IMPROVEMENTS

Public Work in Chicago—Materials of Construction—Cuban Sanitation—Portland and Syracuse Public Work.

Prospects for Public Work in Chicago.

By C. B. Maugham, Chicago, Ill.

There appears to be considerable divergence between published reports as to what was done at the meeting of the Association of American Portland Cement Manufacturers in New York last month and verbal accounts of what took place at the gathering. According to published reports and private information reaching Chicago, the manufacturers formally agreed to advance the price of cement gradually till it should be on the basis of $1 per barrel at the opening of business in the spring, which was generally understood to be about April 1. This version of the meeting was accepted for some time till it was stated authoritatively that there had been no formal agreement, but that the consensus of opinion was that conditions warranted higher prices and views were expressed that the $1 figure would prevail by the time spring business got under way. Whatever the actual condition in the meeting was, it is certain that there has been no perceptible stiffening of prices in the Chicago market. Business is somewhat better than usual at this season of the year and there is every indication that higher figures will prevail when the market opens up to full spring proportions. The amount of inside work in cement going on is quite remarkable for the season and on open days some outside work, such as foundations, is being done. The inquiry for future business, however, is what is giving strength to the market. Chicago dealers figure that this condition in the east would not necessarily affect the Chicago situation to the full extent, as, owing to the capacity of cement works at home, it is always possible to supply Chicago necessities at considerably less than the eastern figures.

Dwight H. Perkins, a member of the Small Parks Commission of Chicago, in an address before the City Club of Chicago a few days ago, advocated a plan which will permit the expansion of Chicago by moving the mouth of the Chicago River farther north and enable the building of a new and large harbor. The realization of the scheme, according to Mr. Perkins, would mean the enlargement of the business district by opening a new area on the North Side, the regaining of Chicago's marine prestige through increased harbor facilities, the adoption of fixed instead of swinging or bascule bridges across the river, since none but lighters would be employed in carrying freight; tunnels would not have to be removed, nor would there be any necessity for deepening the channel; the freight terminal proposition would thus be solved in its freight carrying aspect. Frederick A. Delano, general manager of the Burlington system, approved Mr. Perkins's plan and then offered his plan for the solution of the railway terminal problem. It contemplates six passenger depots in the extreme south end of the down-town business district, side by side on property already owned by the railroads. The passenger tracks would enter the depots at least twenty feet above the surface and slightly above the level of the existing viaduct, utilizing the space beneath for handling on the ground level baggage, express, mail and less than carload freight. The plan also contemplates the erection of office buildings by the railroads opposite their passenger stations, which would be adequate for their needs. Isham Randolph, chief engineer of the Sanitary Canal Board, and other eminent engineers indorsed Mr. Delano's plan as presenting no engineering difficulties.

The City Council finance committee recently took steps toward the solution of the vexatious problem of garbage disposal. The committee recommended that the Council permit advertising for bids for the disposal of the refuse. Forty firms are to be asked, through the specifications drafted by the commissioner of public works, to bid. The specifications call for collection, removal and disposition of garbage, combustible refuse and ashes. The bidders may make tenders for removal or for disposition, and may sug-

gest any form of disposing of garbage.

The Chicago Wide Tire Association has asked the City Council for an opportunity to be heard before its committee in opposition to the wide tire ordinance, which is to go into effect Jan. 1, 1906. The association presents many reasons why the ordinance is wrong and will not be effective in saving pavements. In their views the members are supported by the leading wagon-makers of the city.

North Shore property owners, who comprise the membership of the North Central Association, conducted for a year past on a subscription basis to carry on the work of cleaning by private arrangement the streets on which their property is located, have decided to put the association on a better business basis. Members are to be charged 60 cents a front foot for a twelve months' service, to include the sweeping and flushing of the streets and the care of the cross walks in the winter months. The subscriptions under the new plan have been in excess of anticipations and the outlook for the present year is very favorable, many contracts for the public work to be done by the association already having been let. No favors have been asked of the city and the task of keeping the North Side of Chicago in good condition will be carried on by the property owners without regard to the inability of the municipal government to do its share.

If the corporation counsel's office is able to make the assessment rolls stand the test of the courts, nearly $10,000,000 in public improvements on streets, sidewalks and sewers will be under construction during this year. The Council finance committee is at work on the annual appropriation ordinance and subcommittees are busy considering the needs of the various departments. Three million dollars are to become available for subway construction or other permanent improvement purposes, contingent on the corporation counsel taking the view of the finance sub-committee that the city has the right to retire that amount of water bonds out of the water fund proceeds.

Aldermen who are championing a municipal system of subways are urging the absolute necessity of beginning work early and pushing it vigorously to completion, so that a system of underground transportation can supplement the present inadequate surface and elevated lines. The success of the New York subway transportation has encouraged the Chicago aldermen to urge action without further delay.

Report of Committee on the Materials of Construction.

Presented to the Indiana Engineering Society at Its Annual Meeting in Indianapolis, January, 1905, by W. K. Hatt, Chairman, Lafayette, Ind.

The materials of construction upon which the work of investigation has progressed most remarkably during the past year are reinforced concrete and timber.

Reinforced Concrete—The lines of experimentation which arouse most interest are those (a) directed to a determination of some simple formula expressing the moment of flexure of reinforced concrete beams, (b) as to a determination of the proper unit stress which may be used in steel in tension and in concrete in compression. (a) The results of numerous tests made under the diverse conditions by different experimenters seem to show that the failure of ordinary reinforced concrete beams, in which the concrete is of good quality, either of 1-2-4 or 1-3-6, coincides with the point at which the elastic limit of the steel is reached. Mr. Condron has plotted the results of numerous tests to show that the strength of a beam is simply a straight line function of the amount of steel embedded therein, and the writer here presents the results of tests of about 40 beams made in the laboratory of Purdue University to bear out this statement. The formula expressing the ultimate strength of these beams we express as follows:

$$\frac{M}{bh^2} = 55 + 275\ P$$

M = resisting moment in inch pounds.
b = width of beam in inches.
h = depth of beam in inches.
P = per cent. of steel based on cross-section of beam.

The remarkable thing is that this formula seems to be independent of the kind of concrete, whether wet or dry, or independent of the age of the concrete.

Of course, the higher the elastic limit of the steel the greater the strength of the beam, provided, first, that in getting the stress from the concrete into the steel we do not exceed the proper adhesive stress between the concrete and the steel, which latter danger may be guarded against by the use of deformed metal, and, second, provided that the

concrete is strong enough in compression to furnish the proper reaction which develops the strength of the steel in tension.

(b) Early in the history of reinforced concrete experimentation M. Considere of France announced that the concrete used in his experiments seemed much more flexible and extensible when reinforced with metal than when this reinforcement was absent. He announced that the extensibility of reinforced concrete was at least ten times that of plain concrete. The deduction from this statement is that the steel may be used up to its elastic limit in tension side of a beam before the mortar surrounding the steel will crack.

Prof. Turneaure of the University of Wisconsin has made experiments in which provision was made for a close examination of the beams to determine whether or not very fine cracks might be developed in the concrete long before the elastic limit of the reinforcing steel was reached. It appears that with the material used in Prof. Turneaure's experiments there appeared fine cracks at stresses in the steels corresponding to two or three thousand pounds per square inch. Indeed, these fine cracks seemed to appear at the same degree of extension of the concrete, whether the concrete was reinforced or not. Prof. Turneaure's beams were made of 1-2-4 concrete and allowed to set under water.

Tests by Prof. Talbot indicate that at a stress in the steel of 3,000 lbs. per sq. in., and about 250 lbs. per square inch in tension in the extreme fiber of the concrete, the steel is suddenly elongated as if the concrete in tension had given way and thrown its share of the load on the steel. No cracks, however, are visible to the naked eye at this stage. As a beam continues to bend beyond this point, fine vertical cracks begin to appear. In the case of some beams a crack plainly visible to the naked eye does not appear until the steel has reached a stress of nearly 25,000 lbs. per sq. in. This crack does not open markedly until the elastic limit of the steel has been reached.

Tests made in the Purdue Laboratory on beams made of 1-2-4 concrete, containing crusher dust, allowed to harden under a cover of sand, show a much higher degree of flexibility than either the tests of Prof. Talbot or Prof. Turneaure. This might have been expected when a knowledge is had of the effect of crusher dust in increasing the flexibility of concrete. The tests at Purdue University on beams which were reinforced, deflected approximately ten times as much as those that were not reinforced before cracks appeared to view. Check tests of prisms in concrete, some of which were reinforced, some of which were not reinforced in tension, indicated the same increased flexiblity of reinforced concrete.

The point to notice is that it is possible to make concrete which will permit steel to be used to its elastic limit before cracks appear which are visible to the naked eye. There may be and probably are microscopic cracks, the latter existing before the load is applied. As a practical matter it seems that Considere's announcement is not misleading.

Matters which are of great interest from the theoretical side of reinforced concrete are to be thoroughly investigated by a joint committee of the American Society of Civil Engineers, the American Society for Testing Materials, the American Railway Engineering and Maintenance of Way Association and the American Portland Cement Manufacturers' Association. The importance of securing definite and complete knowledge of the principles underlying reinforced concrete construction, before a serious accident occurs, caused by imperfect or improper construction, and injures the standing of reinforced concrete, is too apparent to need argument. The investigation will include both a determination of the fundamental principles and properties, and also the choice of those conditions which will be most favorable to the conditions of practical design. For instance, the amount of steel which it is most economical to use in concrete of any composition will be determined, and the investigation will also seek to determine whether or not steel of a high elastic limit is economical. The question of adhesion and the necessity of mechanical bond or anchorage for taking up the shearing stresses developed in certain designs, is to be reported upon; the best form of bar whether flat or round; the strength of columns and slabs and other matters will be thoroughly investigated.

Timber — The Bureau of Forestry, United States Department of Agriculture, is making a series of tests of the commercial timbers of the United States, and circular No, 22, entitled "Progress Report on the Strength of Structural Timbers" has just been issued. Copies of this circular can be obtained on application to the Bureau at Washington, D. C.

The engineer has found it increasingly

difficult to obtain structural timber of good quality, in sizes suitable for stringers or derrick timbers. Formerly longleaf pine could be obtained. At present the scarcity and increased price, and the short lengths of longleaf pine have caused engineers to seek substitutes such as loblolly pine or the Pacific Coast woods, the most important of which is the red fir. Circular No. 32 of the Bureau of Forestry gives the results of tests upon the red fir, western hemlock, longleaf pine and loblolly pine. This work is thoroughly practical in its nature, and the conditions of the work are prepared with a direct view to the needs of consumers of timber.

It appears that engineers are not justified in using fiber stresses based on strength other than that of green timber, for the reason that timber originally found on the market is not seasoned to a sufficient degree to increase the strength beyond that of green timber. The results of the tests of joists of structural timber quoted in Circular No. 32 are here reproduced.

SUMMARY OF TABLE I, SHOWING CROSS-BENDING STRENGTH OF STRUCTURAL TIMBER.

Species.	Grade.	Average number of sticks.	Time seasoned.	Moisture.	Weight per cubic foot.		Modulus of rupture.	Modulus of elasticity.
					As tested.	Dry.		
			Months.	Per cent.	Lbs.	Lbs.	Lbs. per square inch.	1,000 lbs. per square inch.
Red fir:								
Shipments A and C	Select	22	6 to 12	22.6	37.1	30.2	8,810	1,925
	Merchantable	29		20.8	34.5	28.4	7,730	1,825
	Seconds	16		19.5	31.9	26.7	6,290	1,630
Shipment B	Select	14	3	27.6	30.9	24.2	6,250	1,280
	Merchantable	15		26.5	33.7	26.6	5,340	1,320
	Seconds	25		26.2	35.1	27.8	4,280	1,400
Shipments A, B, and C	Select	36	.....	24.5	34.7	27.9	7,780	1,675
	Merchantable	44		22.7	34.8	28.4	6,920	1,650
	Seconds	41		23.6	33.8	27.4	5,070	1,490
Average of shipments A, B, and C	All grades	121	.....	23.6	33.4	27.8	6,580	1,570
Western hemlock	All grades	30	3 to 6	32.2	35.4	26.8	5,565	1,260
North Carolina loblolly pine	Square edge	20	3	37.2	42.8	31.2	6,187	1,479
Longleaf pine	Merchantable	26	6 to 12	26.7	53.3	42.1	8,210	1,790

In addition to this work the Bureau of Forestry has been investigating the proper methods of preserving timber, and the effect of the preserving processes on the strength of the timber. Many engineers believe that creosoted timber is more brittle and less capable of withstanding strains than the same timber before being treated with creosote. This is particularly true with bridge timbers and piling. The preserving process involves (1) the actual process of impregnation with a preserving substance, and (2) the preliminary processes of steam seasoning, in the majority of treating plants in the United States. To investigate this matter a preserving plant has been erected on the grounds of the Louisiana Purchase Exposition, and also a timber testing laboratory in connection therewith. Different kinds of timber have been subjected to the various preserving processes, involving the use of vacuum, of steam, of pressure, of zinc chloride and creosote. The results of this work will be to determine the best methods of preserving timber so that a maximum impregnation may be obtained with less expenditure of oil per cubic foot of timber. The material treated has been subjected to mechanical tests according to a very careful and complete working program. Briefly, it is found that a diminution of strength occurs in timber which has been steamed, but that the presence of creosote or zinc chloride is not to further diminish the strength beyond that occurring under the steaming process. The creosote oil, however, remains in the wood in practically a liquid condition, so that creosoted timber will, as far as its strength properties are concerned, be like green timber and will have the strength of green timber.

Railroad engineers will be interested to know that cheap fence posts can be preserved at a cost of 4 or 5 cents each for

the preservative, and made equal in lasting properties to the most expensive kind of posts. The process involves dipping the end of the post in the hot creosote material, after which the end of the post is dipped in a cold bath of creosote. The effect of the warm bath is to expand the materials in the cells of the timber and create a partial vacuum, into which the creosote oil is forced by the air pressure when in the cold bath. The process is very simple, requiring an inexpensive plant that can be set up in the neighborhood of any large city, where a supply of creosote or tar oil can be obtained.

Concerning the standard specifications for the reception of structural material, such as steel, iron, cement, timber, etc., it is only necessary for the committee to call the attention of the society to the fact that the American Society for Testing Materials, Professor Edgar Marburg, Secretary, University of Pennsylvania, has undertaken the work of preparing such standard specifications, and members of the society who wish to prepare their specifications in accordance with the latest practice, will do well to obtain copies of these specifications from the Secretary.

Cuban Sanitation.

The Cuban Congress passed a bill Jan. 9 appropriating $326,000 for the immediate sanitation of Cuban cities. The bill met with considerable opposition, the criticism being chiefly against the Senators for invariably amending House bills. The amount of this appropriation was raised by the Senate to the above amount. No feeling was expressed against the United States, however, for reminding Cuba of her duties, though it was said that Cuba should carry out the work of sanitation progressively regardless of any recommendations of the United States on the subject. The Senate's special committee on sanitation recommended measures granting all municipalities $2.16 1-3 an inhabitant for the cleaning and sanitation of the city, with an additional 20 per cent and 10 per cent, respectively, for the larger towns, according to population and importance.

Public Work in Portland, Ore.

In a recent statement before the city charter board of Portland, Ore., City Auditor Devlin said there had been more public improvements during the last year in Portland than in any five years previous to the adoption of the new city charter. Miles of street pavements, sidewalks, sewers and water mains have been laid and several large and expensive bridges and fills have been completed, aggregating in cost about $2,000,000. A number of blocks of brick pavement have been laid and wooden block paving has been carried on extensively. Bitulithic pavement was also introduced during the year. Regarding this pavement, Mr. Devlin says, "The good qualities of macadam and bitumen are combined in this pavement and it is said to be just the thing to stand the severe test of the large amount of rain, which makes street building in Portland a difficult matter."

During the year about 20 miles of sewers have been constructed at a cost of $176,000 and 13 miles of water mains were laid by the Municipal Water Works Department at a cost of $140,000.

Reports of Officials of Syracuse, N. Y.

The annual report of Frank J. Schnauber, City Engineer of Syracuse, N. Y., states that the city has 130 miles of sewers, of which 12 miles were built during 1904, which is about twice the usual amount built in a year. Of the total mileage of sewers, 32 are of brick, 94 of pipe and 4 of web tile. The city laid 4 miles of pavement during 1904—2¾ miles of brick and 1¼ of asphalt. The department has given 18 miles of grades during the year for sidewalks, and Mr. Schnauber suggests that when ordering cement sidewalks hereafter the Common Council order the street graded.

The annual report of the Bureau of Water has also been submitted to A. R. Thompson, Commissioner of Public Works, by John T. Delaney, superintendent of the Bureau of Water. The net receipts for the year were $277,051.22, which is $11,052.60 in excess of the budget appropriation and $8,962.66 greater than the receipts for 1903. The appropriation was $265,998.62, while the total disbursements were $258,977.22, leaving a balance of $7,021.40. Superintendent Delaney calls attention to the fact that the year just ended is the first in the history of the municipal water system in which no financial aid has been received, either through general city taxation or from the proceeds of bond issues. The revenues alone for the fiscal year have been sufficient to meet not only the expenses of maintenance and operation, but also those for the extension of the system where made necessary by the increasing demands for water service.

HOUSE OF NORMANDIN CONCRETE BLOCKS.

NATIONAL ASSOCIATION OF CEMENT USERS

Proceedings—Coloring Concrete—Testing Blocks—Mixing Concrete—Laying Sidewalks—Waterproofing Blocks—Waterproofing Structures—Cement Posts—Mortar Sand—What Was Said About It—Registration List—The Exhibits.

Proceedings of the Indianapolis Convention.

Readers of Municipal Engineering have been informed each month of the progress of the plans for the convention of cement users called to meet in Indianapolis, Jan. 17, 18 and 19, 1905, the preliminary work leading to calling the convention having been done through the magazine and by circular letters from its office and the arrangements for the convention being in charge of the editor as chairman of the local committee. The Claypool Hotel was finally decided upon as the location for the convention.

As will be seen from the expressions of opinion regarding the convention, given in subsequent pages, all were surprised at the large number present, nearly 600 having registered. The promoters of the convention had obtained reasonably good estimates of the number likely to be present before the members began to gather and provided sufficient accommodations, with a little readjustment, place for which had been provided.

The first assignment of exhibit space was exhausted before Monday of convention week and the number of exhibitors was more than doubled later.

The convention was called to order at 3 o'clock on Tuesday afternoon by Mr. Charles Carroll Brown, M. Am. Soc. C. E., and the seating accommodations provided in the assembly hall were exhausted before the close of the session, requiring an extension of about a hundred chairs to provide for the evening session.

In opening the session Mr. Brown said:

The number of persons present is sufficient justification for the calling of this convention, but it may be of interest to give you a short sketch of the reasons for calling together those who are interested in the use of cement. You all know how rapidly the use of cement has spread in the last few years, the amount of Portland cement used in this country doubling about once in four years until last year it amounted to over 23,000,000 barrels. The use of cement is not so simple as it seems and much bad work has resulted from the fact that the knowledge of the way to handle cement has not spread so rapidly as the use of cement. This is specially true in the block trade, which has developed entirely, you may say, in the last three years. The first descriptive illustrated article on the use of cement blocks appeared in Municipal Engineering three years ago this month. At that time the H. S. Palmer machine was the only one in the market and there were scarcely a half dozen of his machines in actual use. The number of patents on machines now runs well on toward a hundred and nineteen of the leading machines are represented in the exhibits at this convention. The number of block makers to whom notices of this convention were mailed is nearly 2,000 and the daily addition of names to the list shows that it is not yet complete.

The purchase of block making machines by many who were inexperienced in the use of cement resulted in numerous failures from lack of knowledge of materials and methods of mixing them and lack of knowledge of building requirements. This was soon seen and in my editorial capacity I began to call attention to the true reasons for these failures. Some time last summer Mr. A. S. J. Gammon of Norfolk, Va., suggested that a convention of the block makers would be an excellent idea and would be perhaps the quickest method of extending the knowledge of proper methods of mixing and finishing concrete and concrete blocks. His suggestion was taken up and after an article or two in the magazines treating of the uses of cement to test the feeling on the subject, circulars were sent out asking for suggestions as to scope of the convention and time and place of meeting.

It was then discovered that Mr. John P. Given of the Pickaway Cement Block Company, Circleville, O., had previously considered the convention idea and developed some plans for it, but had not

published them. The St. Louis Exposition gave an opportunity to get the ideas of the cement users represented there together and the present convention is the result.

The early suggestions came from the cement block makers, but the interest in the movement has been general among cement users, and it was soon seen that the association which it is proposed to form during this meeting should be broad enough to include all those in the cement field. It may be found desirable to divide the association into sections holding separate meetings during the convention, on account of the large numbers in attendance and the diversity of their interests, but all the indications point to an association with broad enough name and purpose to cover the whole cement field.

In making plans for the convention and casting about for a man to nominate for temporary chairman of the convention, to serve until the permanent organization is completed, I tried to find a man with great interest in the cement industry, one who would be as free as possible from entangling alliances, and who would have no tendency toward anything but the strictest impartiality and justice, at the same time having the force of character necessary to keep the members of the convention always closely to the matter directly under discussion, and prevent them from indulging in personalities regarding either men or materials, and tact enough to perform his duties with the least possible offense to individuals. I was fortunate enough to find such a man, who has also a wide acquaintance with the cement working field. I therefore take great pleasure in nominating as temporary chairman of this convention a man whose desire for its success is fully equal to my own or that of any of you, Mr. John P. Given of Circleville, Ohio.

Mr. Given was duly elected as temporary chairman and Mr. Brown as temporary secretary. Mr. Given said:

It is certainly a great pleasure to me to be selected as presiding officer of the meeting of such a body of intelligent business men. This convention has been on my mind ever since October, when Mr. Brown and I met in St. Louis. We have corresponded and talked with each other planning to make this convention a success and it delights me and I likewise think that every individual on this floor is delighted in the success so far attained. There is no reason, gentlemen, why this association should not become one of the largest associations of this character in the country. I feel that as large as it is today with concerted action our success is assured.

We have tried in issuing the call to take in the various parts and divisions that will be necessary to make this convention as wide reaching as possible. We want to cover every line; we want to cover the monolithic and reinforced concrete work, and when you take into consideration the wide scope which this convention covers, you must certainly know that it will take concerted action on the part of those who are interested to make it successful. There is no reason why ..e brought about and brought about in a splendid manner. You know the Psalmist says: "Behold, how good and how pleasant it is for brethren to dwell together in unity." Now this, gentlemen, should be one of our motives, that we should dwell together in unity. We must not forget to live in harmony; harmony should prevail. The more that harmony prevails the more valuable our sessions will be.

Committees on constitution and by-laws and on nominations for officers were appointed and combined into a committee on plan and scope, to report at the evening session of the convention. The committee consisted of E. B. Swift, Indianapolis; W. H. Phillips, Columbus, O.; Ernest McCullough, Chicago; Geo. H. Carlin, Oskaloosa, Iowa; W. E. Horn, Memphis, Tenn.; A. S. J. Gammon, Norfolk, Va.; J. P. Sherer, Milwaukee, Wis.; Geo. L. Stanley, Ashtabula, Ohio; A. C. Birnie, Springfield, Mass.; A. Baumberger, St. Louis. The committee retired and the convention listened to the following paper:

Coloring of Concrete.

By J. P. Sherer, Milwaukee, Wis.

Representing the pioneer block manufacturing company of the Northwest, we have made many experiments in coloring artificial stone.

First, I will state to you that we found that ground colored natural stone and mineral iron oxide were the most desirable and practical from the fact that they in no way weaken or damage the setting qualities or our stone, but, on the contrary, they add very materially to the strength of the finished product. We tested many different coloring compounds, some with fair results, but all those containing acids or greases (among these are graphites and lamp blacks) are found to be detrimental.

We tested some very fine samples of ground crushed stone from Europe and from different sections of the States, always with the same result. They are too weak in actual coloring matter to bring about the desired shades, and always with the same complaint, too expensive; expensive, at least, in the manner we always use coloring, as we color our entire stone.

Very early in our manufacturing experience we dropped the facing plan and adopted the plan of coloring the entire stone. Beginners are led to believe, as we were, that the facing of stone is desirable. In theory it is all right; in practice we found it undesirable, and were not satisfied with the results financially. That many beautiful results may be obtained is true, both in the facing and coloring of stone, but that the facing of blocks is not practical, and that they are not merchantable, on account of the cost of manufacture, is also a fact, and we have found that the best results are obtained by keeping as close to the manufacture of your primary product as possible. We may at times find customers that will pay the additional price, but they are the exception and not the rule.

To illustrate this, we will mention that we were recently asked to figure on a very elaborate design for an office building for one of our large manufacturing concerns, but when we made our estimate and named the price, the owners simply shook their heads. That one of our competitors made this building is a fact, and that it is a handsome building is true. However, the contractor recently asked me to condole with him on the results financially. The only satisfaction I could give him was the old reply, "I told you so."

In making tests either with coloring concrete blocks, or concrete of any character. it is our motive to make our product at a minimum cost, and market it at a fair profit in competition with other non-combusible materials.

The colored stone that we are most frequently called upon to imitate in Wisconsin, is what is known as, "Portage Entry Red Stone." This is a Northern Michigan product, and we are at a loss to know why they term it "red" stone, for, in fact, it is a very light shade of pink and the most singular condition is that if we were to produce an artificial stone as light in color, the public would exclaim at once, "Why, how pale it is. It must have faded considerably." Our only test is to place the natural product by the side of the manufactured, and allow our customers to see the difference. Then they say: "I did not imagine it was so light."

We have found it necessary to color our artificial stone several shades darker (when first made) than the natural product. We are frequently asked, "Will not this color fade?" That the stone grows lighter as the cement sets is true, and it will continue to grow lighter until it has attained a thorough initial set and has become dry. This setting and drying process (as all of you well know) is governed largely by the temperature and time of year and the exposure to which the manufactured product is subject. All of you who are contractors and builders, know that when you desire a deeper or darker shade of mortar coloring, you are obliged to make your wet mixture many shades darker than when it it finished and the action of the lime has taken place.

We are also frequently asked what proportion of coloring matter we use per stone. This is rather hard to answer from the fact that different block manufacturers make many different sizes of stone and that the material used in different localities varies so much in character. We also find that different cements change the coloring more or less. However, this is not perceptible to any great degree.

In the manufacture of red stone with such sand and cement as we are in the habit of using, to obtain a strong, deep, cherry red after final setting, we find it is necessary to use from 5 to 7 pounds of the pure mineral oxide per cubic foot of concrete. In this mixture we use clean silica sand containing no loam or clay of any character and very little organic matter. We also found that the thorough mixing of the color with the cement before adding sand was very necessary.

We discovered that to get good results it was absolutely imperative to have our sand thoroughly dry and that we were obliged to mix sand, cement and color together thoroughly, much more so than in making the ordinary concrete block. We learned this early in our contracting career, when at times we found it necessary to use lamp black in producing dark mortar color. We were at a loss many times to find some liquid mixture with which the lamp black would thoroughly assimilate. At times we used vinegar, at others stale beer. By simply taking very fine dry sand and mixing the lamp black with it thoroughly we found no trouble in getting an even, dark color for our mortar.

We have been for some time endeavoring to get a green stone for an architect and customer, but as yet have not been satisfied with the results. We did make a green stone, the body of the block being of a moss or olive shade, with streaks

of livelier green color running through, but we have been somewnat afraid to recommend this stone to the architect, as we have not fully satisfied ourselves as to the action of this ultra-green on the cement. Our first trial was some six months ago, and we are watching the product of this trial very carefully; as yet it shows no signs of disintegration, and we are now subjecting it to the strong climatic changes, to see what effect the weather will have upon it.

We also found that to get an even and artistic product, it is essential to have our materials as nearly in the same condition as possible, as regards moisture and mixing, all these little details causing additional expense over the original product we made.

We are frequently asked, "Have you experimented with hydrated lime, stucco, or other fine materials, in making colored concrete? Yes, we have experimented with all of those, and, in addition, have used other fine filling materials, such as Warrenite ground flint clay, also ground silica. I found that hydrated lime and gypsum quickened the setting qualities of the material, provided enough water was used and added from time to time, to keep the concrete from burning or falling apart, as the lime or stucco absorbs the moisture more readily than the cement, and robs it of the moisture it must have. I also found that if I succeeded in keeping it moist enough, after a period of six months to a year, a condition almost akin to decomposition set in, and the mass would crumble and fall apart. However, the latter conditions did not occur with the ground Warrenite or fine silica, but we did find that it was necessary to add about two more parts cement to get desired results with the extremely fine material.

You ask: "Why use such fine material?" We found that in producing a beautiful colored article of artificial stone, it was necessary to have a very dense product, especially when your customer gives the stone a close and critical inspection.

We also found that we had to contend with a common enemy, that of efflorescence, or a white exudation that many times appear on concrete. We think the colored stone is more trouble than the ordinary stone, on account of its delicate and finer face, and consequently it shows more readily than on the natural stone. It has been our experience, and it is also the consensus of opinion of those who have given this matter study, that this condition is largely governed by the amount of moisture given to the product, both when it is originally mixed, and later, when passing through the process of curing. We hope by continued study and observation to be able to determine the exact amount of water to use in order to prevent this trouble.

We have also observed that the temperature had considerable to do with the forming of this coating on the exterior of the stone. We notice in ordinary brick work and in natural stone, in walls where there is an excess of water deposited, this exudation passes through the wall more easily in freezing and thawing weather. While it may not appear to any extent on drier portions, it will accumulate in moist places and form considerable coating on the surface. However, we find by applying at intervals a solution of potash and dissolved alum, we can almost eradicate this difficulty, and with each succeeding year it grows less and less, until it finally fails to appear at all. This is accounted for by the free lime becoming exhausted, and for this reason we advise and use as limited an amount of mortar as possible in laying blocks in place, and protest against the filling of any of the natural air spaces with mortar or any foreign material.

Inquiry has been made as to what effect fire or extreme heat has on colored or faced stone. That the colored stone makes an excellent showing in a fire test is true, but that the colored faced stone does not fare so well is on account of the difference in the expansion and contraction of the two bodies of concrete, causing the denser body to separate from the coarser or more porous material.

Our test of stone under hydraulic pressure shows more defects when faced, the facing spalling off. This is the case, especially when any great amount of facing is used, by way of illustration, from ⅛ to ⅜ or ½ inch in thickness. When but a light dusting of facing is applied to the coarser material, this separating under fire or pressure test is not very great.

As to the relative strength of colored stone, we will say that all tests as made by us, have shown to the advantage of the colored product, especially when colored with pure oxide of iron or pure manganese, the former for red stone, the latter for brown stone. Our tests show, however, that our gain was more tensile than crushing strength, as it appears to give the product more fiber.

In explanation of our tests will say that they are all of a primitive rather than technical character, except, perhaps, that of the crushing under hydraulic pressure. All of these tests were on blocks made of what we term finer grades of material, as we use this character of material to obtain a more artistic rock-faced stone. We also observe with these tests that blocks containing coloring matter, especially oxide and manganese, invariably show from 8 to 11 per cent more resistance than any uncolored stone. However, the additional tests made at six months, do not show as large a percentage of gain.

Mr. Sherer, having withdrawn to meet with the committee, the discussion was closed, after bringing out objections to the use of gypsum in the mixture for blocks and the fact that about 60 pounds of coloring matter are required for each two barrels of mortar.

Prof. Allen's paper was read by the secretary in his absence as follows:

Testing of Cement Blocks.

By Prof. John R. Allen, University of Michigan.

With the increasing use of cement as a building material there should be devised some standard method of testing the various cement products. As long as cement was in use for sustaining loads which produced only compression in the material, the testing of the finished cement product was of less importance. Recently, however, cement, especially in the form of reinforced concrete, has been used where it is subject to strains in tension as well as in compression. The strength of cement in tension being only from one-fourth to one-sixth of its strength in compression, it is very important that we know what the tensile strength of the cement product is.

Ordinarily the strength of cement only is determined and this is done by testing the strength in tension of a neat briquette. This briquette is usually carefully made in a cement testing laboratory. These tests, however, are only useful in so far as they give the strength of the cement. Take, for example, concrete. The strength of the concrete does not depend alone upon the strength of the cement, although this is probably the most important item. The broken stone, gravel and sand that are mixed with the cement play a very important part in the strength of the finished product. This is particularly noticeable in concrete which has been made from gravel. If the gravel contains earthy matter it very materially lessens the strength of the concrete, even though the cement used may be of the very best quality.

The use of sand which is not sharp enough or which contains some earth matter reduces very perceptibly the strength of the concrete. In order, then, to get really reliable results in testing, concrete blocks of the finished materials should be tested. These blocks should be taken if possible from the regular factory stock and not made especially for test purposes. The method which the writer has used in testing cement blocks is as follows:

The block is placed on the platen of an ordinary testing machine and supported on knife edges 20 inches or more apart if the length of the block will allow. The load is then applied at the center of the block equally distant from the supporting knife edges. This subjects the block to a cross-breaking strain, the upper side of the block being in compression and the lower side in tension. Concrete, having a much lower strength in tension than in compression, the block gives way first on the lower or tension side. The results obtained from tests of this kind give a comparative value of the tensile strength of the materials used. After the block has been broken a piece is cut from some uninjured portion of the block and tested in compression. If possible, this compression piece should be at least 3 inches square and not over 8 inches long. Knowing the strength of the concrete in compression and the moment of the cross-breaking load, the approximate tensile strength of the concrete may be computed. The following table contains the results obtained from a number of concrete blocks. The blocks tested are different forms of building blocks:

No. of Block.	Distance between supports.	Area in compression.	Strength in cross breaking.	Strength in compression.	Comp. strength per sq. in.	Tensile strength per sq. in.
1	13	12	5450	7250	604	.....
2	24	13.1	3000	15000	1060	.....
3	21	12	4100	8450	705	121.8
4	21	15.2	4000	22850	1500	300
5	21	16	2900	15100	940	237
6	21	11	3600	14550	1320	235.5

No results are given for tension in Blocks Nos. 1 and 2, as it was necessary to test these blocks on the side, putting

them in a position in which it is very difficult to measure the tensile strength accurately. Block No. 1 showed very low tensile strength owing to a lack of uniformity of the material of which the block was composed. Block No. 2, which was made of the same material, showed much better results. Block No. 3 also showed low results. In the case of both Blocks No. 1 and No. 3 the material composing them was very fine and their low tensile strength is probably due to there being an excess of sand and the stone used being too small. In addition it is quite probable that these blocks contain some earthy matter as the fracture of the block seemed to indicate. All of the blocks in the table above were made from first-class cements. Blocks No. 3, 4, 5 and 6 were mixed—one part of cement, two of sand and three of broken stone—and were all at least four months old. These blocks showed quite widely different results, considering the fact that they were supposed to have been made from the same material. The difference is undoubtedly due to the improper mixing of the materials which composed the block, and also to the use of sand and gravel which contained a small admixture of earthy matter.

The points which I have endeavored to bring out in this very brief paper are two. First, In a great many cases the manufacturer does not give sufficient attention to the materials used in forming the concrete. In most cases more attention is given to the strength of the cement. This of course is very necessary, but as much care should be given to the securing of suitable sand and broken stone. If gravel is used in place of broken stone it should be selected with great care, as gravel concrete is much more apt to be uncertain than concrete made from broken stone.

Second. More attention should be paid to the testing of the finished product; that is, the testing of full-sized concrete blocks. The testing of sample briquettes is quite necessary and desirable, but it does not always indicate the strength of the finished product when made up in final form. In inspecting concrete work it seems to me highly desirable that samples of the concrete as mixed should be taken directly from the mixing board, formed into suitable-sized rectangular blocks and tested in cross-breaking and in compression. These blocks would then show exactly the strength of the material used in construction.

It would seem to me highly desirable that a committee be appointed from the various associations interested in the manufacture and use of cement to consider the best methods of testing both cement and concrete and this committee should make its recommendations to the associations for their adoption so that standard methods can be employed for the testing of concrete materials.

In the discussion of this paper emphasis was laid on the necessity of proper proportions of materials, and the use of sufficient water to insure crystallization. The effect of fire upon concrete made of limestone was described, the limestone near the surface being changed, if the heat is sufficient, into lime, carbonic acid being driven off, resulting in disintegration of the surface. Mr. William Seafert of Chicago commended the attention of the author to the tensile strength of the blocks as determined through the cross-breaking tests, and described methods of increasing the tensile strength by means of steel reinforcing. He did not, however, consider the question of tensile strength to be of much practical importance to the ordinary block maker.

Mr. Shawell of Sebring, Ohio, described some test blocks made with one-third "dregs," refuse burnt clay from tile works, and two-thirds sand and gravel, claiming greater toughness for these blocks. Being fire clay, the "dregs" made the color of block lighter. Mr. Shawell also called attention to the great strength of blocks made of washed cinders. Mr. Humphrey of Philadelphia stated that anthracite coal ashes made poor concrete, but that cinders from bituminous coal had been used successfully. The trouble with cinder concrete is that it requires absolute inspection of the cinders, and if they are inferior they make inferior concrete. If the cinders are carefully selected they make fine concrete.

Mr. Roess of Oil City, Pa., tests his materials by taking samples from the mixing board, thus getting the actual concrete used.

Mr. Humphrey, in answer to a question regarding the use of lime in cement concrete, said that ground lime is not nearly so beneficial as slaked lime, which is thoroughly hydrated. Mr. Seafert gave an account of the general use of hydrated lime for making concrete waterproof in Europe.

At the evening session of Tuesday Mr.

A. L. Goetzmann of Chicago read the following paper:

The Dry Mixture of Cement.

By A. L. Goetzmann, Chicago, Ill.

The subject of my paper is the "Mixture of Concrete." A broad subject and one upon which much has been said and written. There is a strong difference in the treatment not only of the mixture, but subsequent manipulation as between the so-called wet or "slop" mixture of ordinary concrete construction and the dry mixture used in the manufacture of cement blocks, a phase of the subject little considered by writers, but of primal importance to those who are engaged in that pursuit.

I have, therefore, taken the liberty of departing from my text to the extent of considering wholly the "dry" mixture and the manufacture of concrete or cement blocks under this method, in the belief that from a discussion of this subject may be evolved a method of procedure for the block manufacturer which may be made of value to the recruit entering the ranks who is now practically without literature and left almost wholly to his own devices.

In this paper I have endeavored to outline methods for cement testing, mixing and general block manufacture which shall, I hope, be of advantage to the small manufacturer, to the man who has not the facilities for elaborate testing, whose business will not permit the employing of expert cement men, but whose failures may militate against our product to the same extent as if he operated in some of our larger cities, and on a large scale.

In this effort I have asked for and received the opinions of some of the foremost block and machinery manufacturers of the country as to a few of the more important points connected with block making. I shall advance my own individual ideas upon points when block men are at variance, and, as far as possible, hope to bring out sufficient discussion along these lines that the ultimate results may be to the benefit of the average block manufacturer.

The first important consideration in the making of a block is the securing of a cement which answers the purpose of such construction. Needless to say, no natural cement will answer the purpose. Authorities condemn puzzolan cement, so that the matter simmers down to that of Portland cement alone as being satisfactory. In the selection of a Portland cement for block manufacture the question of price should not be considered. That Portland cement, which by testing gives the best results, should be purchased, regardless (at least within due limits) of price. By this I do not mean an imported cement. We are making today in this country cements which are fully as good as the best imported.

Mr. F. W. Hagloch, C. E., gives in his treatise on the manufacture of artificial stone and concrete some admirably simple rules for cement testing and I do not feel that the subject can be better handled than by quoting him.

"It is the object of this article to give several plain and simple methods of testing cement to a sufficient extent to meet the requirements of cement users. Upon the receipt of a consignment of cement, take a pound sample for every tenth barrel and keep separately; divide it into three equal parts, the first for a water test, the second for tensile strength. For the water test place the sample in a cup or saucer, add water thereto drop by drop. Should the cement absorb the water freely it is a positive sign that it is a Portland cement. Should the cement absorb the water orly to a small extent and is dark in color, it is a very low grade Portland cement, but if light in color it is a puzzolan cement made from furnace slag and entirely unfit for artificial stone purposes.

"Dark cement that absorbs water readily is usually a good cement, so far as strength is concerned, but having been burned at low temperature, it is only fireproof to that degree of heat at which it was burned in its process of manufacture. For the second or tensile strength test, take second sample of cement, add sand and aggregates of same proportion as you intend in making stone, mix, mold and tamp and season according to instructions for the kind of work you wish to construct. Tensile strength can be best determined with a block 1½ inches square and 6 or 8 inches long. When block is one month old place about two inches of one end firmly in a vice and break by applying weights to the free or extended end at a distance of four to six inches from the vice. A block 1½ inches square made of one part cement and three of sand should carry 400 pounds when seven weeks old. This same block may be used to determine crushing strength, but as crushing strength is usually determined at an earlier date, we give the following: Take third and last

sample, prepare same as second, and at the end of twenty days crush with sledge, at the same time crushing a similar-sized block of hard limestone in the same way and compare the strength of each in this way. The cement must be firmer than the limestone. I am aware that the average engineer ridicules this method, as it is impossible to form a table giving pound weights required in crushing same, but remember that this same engineer would test your cement with other sand or without any sand whatever and pronounce the cement as strictly first-class without the faintest idea of the nature of the sand and aggregates your situation may prove convenient or compel you to use.

"In defense of these rude but practical methods of testing cement, I wish to state that I have tested cement with modern testing appliances and I have learned that laboratory tests are splendid for advertising, but for real work nothing but practical tests can be relied upon, and practical builders having had experience with cement construction approve the methods explained in this article.

"The test of the greatest practical value is the determining of the rate of setting. This is best done by measuring the time from the moment water is added until the cement paste ceases to be fluid and plastic, which is called the 'initial set,' and when it has acquired a certain degree of hardening is called the hard set.

"All work occasionally requiring retempering of cement must know the time required of the cement used for the initial set or hardening, as retempered cement is almost worthless after once hardened except when used as aggregates.

"Tests for time of setting should be made with sand and aggregates mixed with cement in the proportion intended to be used; time tests with pure cement show different results. Always remember that the setting of the cement is a change from a plastic condition to a solid state."

Sand—Opinions vary considerably as to sand, running from very fine to very coarse, but all agree on the one point that it should be sharp and clean. It is my own individual opinion that question of size of the sand makes comparatively little difference, so long as it is clean, sharp and enough cement be used to properly fill the voids. I have seen blocks which tested good strength by crushing, which are made of a mixture of crushed granite which was passed through a screen of forty to the inch, and also an equally good block made from the very coarsest of torpedo sand.

The main consideration, as I have stated, should be that the sand be free from clay, iron rust, vegetable matter or other impurities and as nearly as possible pure silica. The best sands are those which have been washed to remove these impurities. Care should be exercised in bank sand that there be no nodules, iron rust pockets or rotten stone in the bank. It is recommended oftentimes that two or three different sizes of sand are an advantage, and I quite agree with this, provided the different sizes are screened and the mixture be made of known proportions.

Aggregates—There seems to be a uniform opinion among machine men that larger material than sand is advantageous, and there is no doubt that where there is enough sand and cement used to fully fill the voids that it makes a cheaper block. As to whether it adds to the strength depends entirely upon the material of which it is made. Such aggregates may vary from size to pass a one-half inch ring to that which will pass a one and one-half inch ring.

An important feature often neglected in making blocks with an aggregate is that of cleanliness. All such material should be thoroughly washed before incorporating into the concrete. A material with dust or clay on it will effectually resist the adhesion of cement.

Hard crushed limestone, gravel, crushed granite, quartz or trap rock are recommended. Soft limestone is bad on account of its being so great an absorbent of the water and all limestones are placed under the ban by some on account of the danger of disintegrating in fire.

Mixing—Upon a proper and thorough mixing of the cement and sand or cement sand and aggregates depends the quality of the finished product. The best of cement and pure silica sand, poorly mixed, will produce a poor block. There are a number of first-class power mixers on the market, and machine mixing is always preferred to hand work, as it produces a uniformly thorough mix, as the hand work will not. Where hand work is necessary, spread the aggregates over the body of the mixing board at a uniform depth, spread the sand evenly

over this and the cement over the sand and, with shovels or hoes, turn each over and back at least three times dry, smooth the mixture over with a shovel or hoe and see that the mix is of uniform color. Sprinkle and turn again, sprinkling as it is being turned three times, test for streaky appearances again. Turn until streaks entirely disappear.

As to the proportion which should be used, this is entirely dependent upon the sizes of the sand and aggregates and can only be told by testing.

Most block manufacturers recommend a given proportion as 1 to 5, 1 to 4, etc., with no knowledge of sizes of material to be used. This is not a safe proposition. An excess of cement is waste and failure will result from a deficiency and neither can be told until one has a knowledge of materials to be used.

A perfect block is that wherein all the voids are filled and every particle of sand and aggregate is covered with cement.

To secure knowledge as to what is necessary to produce this block, thoroughly dry and screen your aggregates into two sizes. Taken a given volume, say two cubic feet of the coarser, mix with this all of the finer which it will take without increasing the volume, mix with this all the sand which it will take without increasing the volume. Add water until it rises to the top of mixture, measure and add, by volume, cement of the volume which the water shows. Where torpedo sand (which runs from the size of a pea down and from which fine sand has been washed) may be obtained, a mixture of the coarser aggregates with the torpedo sand saves the necessity of extra screening and gives same results.

A series of experiments demonstrates that a mixture made with torpedo sand and aggregates ranging from ⅛ inch to 1½ inch requires proportions of 1, 2½ and 4. Tests with the coarser and finer materials shows 1 of cement, 2 sand, 2 of fine and 4½ of coarser materials, and where a medium sand is the only available material a proportion of 1 to 4 has proven necessary.

Of such a mixture may be made a block every void of which is filled. Sufficient cement is used so that every particle is covered and so that voids between the granules of sand are filled with cement, making a firm bond between such granules and between the aggregates. Your block is dense, offers strong resistance to the passage of moisture, is fireproof and will stand a crushing strain equal to the very best hard limestones.

For a block composed entirely of sand and cement I should recommend a mixture of two sizes of sand, a coarse and a fine, testing the proportions required exactly as with aggregates. Do not, however, let the matter rest with such tests. In practically every block plant the sizes of sand and aggregates used are constant. These tests are to be used as a starter. Make up your blocks of proportions these tests indicate. After thoroughly cured and dried, break them, note their structure, density, etc. A good block in breaking should break across the stone of the aggregate instead of pulling it from its bed. If possible subject your experimental blocks to test at some good testing laboratory and vary your proportions as such tests teach you. In this, as in every other phase of the blockmaking industry, never admit yourself as knowing all about it or as being perfect. The mixtures above given will not give the fine texture of face required in many instances and facing of finer material is necessary. For this finer material of crushed granite, marble, glass or fine, clean silicious sand or crushed silica may be used, the degree of fineness depending upon the consistency desired. Such mixtures in proportion of 1 to 3 give good strength and are sufficiently dense.

It is sometimes recommended for securing a whiter face and a more nearly waterproof one, that a percentage of lime be used. This is a dangerous practice since the deterioration in strength by the admixture of lime is very rapid and results in the hands of the average workman are at least problematical.

The amount of water necessary for the "dry" mixture most used depends upon the materials, the test most often applied being to press some of it in the hand. It should stick together and leave only a small amount of moisture in the palm. The mixture should be just wet enough to cling together after tamping and not enough to stick to the face of the mold. A short experience teaches one so that the appearance of the mixture will tell when sufficiently wet.

Curing—The curing of a block is to my mind one of the most important processes in the block manufacture. We may take a block made of the best Portland cement, clean sharp sand, and a satisfactory aggregate, well mixed and

thoroughly tamped and spoil it by not properly curing.

The primal requisite in proper curing is water, and plenty of it. The sprinkling of a block two or three times a day is not sufficient. In my opinion, the cement block of a few years hence will be cured entirely under water. The best value of cement is only secured by the admixture of water in quantities as the cement needs it. A block should cure uniformly throughout. The inside is wet continually, with the outside wet but periodically. With the fourteen hours of night intervening between sprinkling it is reasonable to suppose that the crystallization will not take place uniformly, internal stresses will set up and the best strength of the block is lost. Cover the finished block after the first twenty-four hours with hay, straw, burlap, sand or any material which will hold moisture. Thoroughly soak the enveloping material with water and keep it so for at least six days.

If this method is not feasible, put on a spray which will run continuously. Let them have all the water they will take up and let them have it when they want it. Cure six to eight days and dry at least ten before placing in the wall. Do the curing out of the sun and wind.

A series of questions of general interest propounded to twenty cement block and machinery manufacturers brought forth the following replies:

What are your preferences for block manufacture? Eight expressed preference for sand and cement; six for sand, crushed stone and cement; six for sand, gravel and cement.

What size sand? Coarse, eight; fine, twelve.

Do you recommend crushed limestone for blocks? Yes, five; no, twelve; yes, if hard, three; nine of objectors did so on account of fireproofing considerations.

When sand and cement alone are used what proportions? Five to one, three; four to one, twelve; three to one, five.

When larger material, what proportions? One-to-two, three, one-two-four, seven; one-two-five, seven; one-three-six, one; one-two-three, two.

What length of time do you recommend for curing blocks? Varied from six days to two weeks. Majority about seven days.

Have you ever used finely crushed marble, granite or quartz for block manufacture? Yes, 6; no, 8; no answer, 6.

If crushing tests have been made, state results. No answer, 9; no tests, 6; a little less than fine sand, 2; good, 3.

What is your opinion of block so made? No answer, 9; good if properly made, 6; sacrifices strength to beauty, 1; poor, 4.

Summing up these expressions the preponderance of opinion is as follows:

Sand and cement mixture for manufacture. A fine sand preferred to the coarse, proportion of one part cement to four of sand, opposed to crushed limestone as aggregate. Where aggregates are used, proportions of 1 to 2 to 4 and 1 to 3 to 5 equally favored. Blocks to be cured by sprinkling at least seven days. Generally opposed to use of fine crushed material for blocks,—but experience limited.

The cement block industry has reached that point in its development wherein a meeting such as this and the formation of an association such as this promises to be, is essential.

The business is on its feet, the plant is well started, product selling. It is time to stop and ask ourselves a few questions. Are we doing the best we can? Are we turning out the block we are telling our customers we are? Are we doing all we should for the confidence the building public are placing in us? In other words, don't we need a little more education? Would it not be a good plan for me and my competitors to get together and work up a plan of advertising to acquaint the public, the architect and the engineer with the cement block instead of each endeavoring to convince him that his individual block is the best and only one.

Is not the time here, gentlemen, when we should recognize the common ground upon which we stand? A time which calls for us to get together for the interests of all--education, insurance rates, publicity, laws, etc., etc.

Other interests recognizing the handwriting on the wall are assailing us. I read but a few days since an article in a magazine devoted to hollow tile and named "Fireproofing," wherein was an article showing a cement block failure in a little town in Oklahoma. I have endeavored to substantiate the story, but without success. The principle of the illustration, however, is there. The blocks may have been poor, they may have been made of a proportion allowing so little cement that they would absorb their own weight in water. The article was given great prominence and (from the standpoint of the hollow tile man) deservedly

FIRST CONVENTION OF NATIONAL ASSOCIATION OF CEMENT USERS.

About one-third of those registered at the Indianapolis Convention appear in this photograph.

so. The point of the illustration is that the one who most strongly recognizes the competition and is most affected is presenting a solid front against the concrete block.

Our duty is to educate the block maker wherever he operates and whatever block he manufacturers, so that failures shall not occur. Educate the public to the value of the cement block. Place our product on a plane to meet the approval of the architects and builders, and give publicity to our fire and other tests.

Devise such ordinances for our cities and towns as will compel the making of a good block and behind which the architect may stand and such as will show the advantages over other products.

A cement block twelve inches thick is stronger than an eighteen-inch rubble stone wall, yet in most of our cities we stand on the old ordinances and put in our blocks on that basis.

A well made cement block with 30 per cent voids is stronger than a rubble stone wall of the same thickness, yet the alderman presents an ordinance calling for not exceeding 15 per cent voids, and we let him do it. Why? Because we have not gotten together, secured expert tests and forced him to take a proper position.

The old illustration of the man's sons and his bundle of rods was never better illustrated than in this new industry.

Let the slogan of the National Association of Cement Users be education for self, education for the public, a perfect block.

The question of the use of hydrated lime in concrete arose again. Mr. Rush reported that the results of early tests showed him that he had a little stronger cement when he used hydrated lime with gravel, coarse sand and cement, and said that he wished to know whether trouble would develop in the future. Another gentleman from Ohio reported that the use of about 40 pounds of hydrated lime to the barrel of mortar made concrete blocks which were impervious to water and added to their strength and beauty of appearance. The same had been used by others for two years or so with no bad results appearing. Clean limestone dust and fine crushed stone was used to make these blocks.

The question of definition of fine broken stone and fine sand was raised. The general expression seemed to be that fine crushed stone would pass through a ¼-inch mesh and fine sand would pass a 25 to 30 mesh sieve.

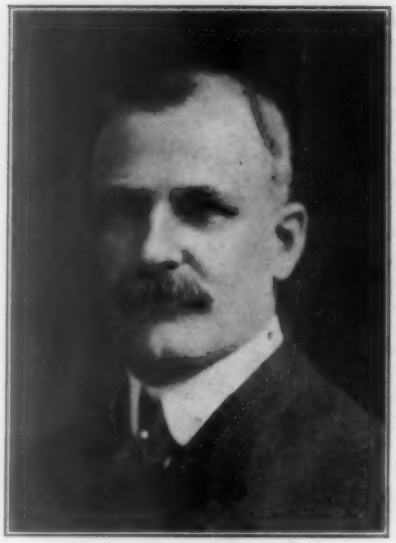
Mr. G. T. Fulton raised the question of cleanliness of sand. He cited the tests in the laboratory of the Ohio State University to show that 15 per cent of loam in the mortar even increases the strength of the test briquettes, and that samples, subjected to freezing and thawing, heat and cold, stood these tests successfully. Longer time was required for setting. Mr. Humphrey called attention to the necessity of care in using the term loam. It seemed to be true that the so-called loam used in the Ohio experiments was not ordinary soil with a large proportion of organic matter such as limestone or clay. Mr. W. F. Barrows reported that in his experience wet mixture gave better results than dry with limestone screenings, but he had never made a stone of this mixture equal to those made of cement, sand and gravel.

In reply to a question, Mr. Goetzmann called attention to the great difference in limestone, some kinds not giving satisfactory results, while others were entirely so. He also said that much of the so-called clay in limestone screenings is really fine limestone. Of ten kinds of limestone tested in his plant but three gave satisfactory results. He also warned the convention against imperfectly hydrated lime, showing the German thoroughness in hydrating lime and the good results obtained by them in its use, and predicting failure from the quickly treated and marketed product on the American markets. Months of time seem to be necessary for perfect treatment.

Mr. Richard L. Humphrey gave a very interesting lecture upon the subject of cement, which was illustrated with stereopticon views. He sketched briefly the development of the cement trade in the United States, the improvement in the quality of cement as shown by the results of cement tests, the results of tests of cement products, including reinforced concrete beams and floors at the St. Louis Exposition and elsewhere. The lecture was not written and Mr. Humphrey promises to have an abstract of it for the proceedings of the convention, when published, with illustrations.

The report of the committee on constitution was presented and made the special order for consideration at the session of Wednesday morning.

The entire session of Wednesday morning was occupied with the consideration



JOHN P. GIVEN, CIRCLEVILLE, O.
First President, N. A. C. U.

RICHARD L. HUMPHREY, PHILADELPHIA.
President for 1905, N. A. C. U.

A. L. GOETZMAN, CHICAGO, ILL.
First Vice-President, N. A. C. U.

JOHN H. FELLOWS, SCRANTON, PA.
Second Vice-President, N. A. C. U.

of the constitution and by-laws, which were amended in some respects and passed. The election of officers followed. Those elected were: John P. Given, Circleville, Ohio, president; A. L. Goetzmann, Chicago, Ill., first vice president; John H. Fellows, Scranton, Pa., second vice president; H. C. Quinn, Dublin, Ga., third vice president; A. Monsted, Milwaukee, Wis., fourth vice president. The nominating committee recommended the election by the executive board of Chas. C. Brown of Indianapolis, Ind., as secretary, and A. S. J. Gammon of Norfolk, Va., as treasurer. The executive board announced later in the proceedings of the convention, after its first meeting, that this had been done.

At the session of Wednesday afternoon Dr. Holmes of the U. S. Geological Survey presented a statement of the work done at St. Louis and by the Survey in testing of cement and cement products, and a resolution, presented by Mr. R. L. Humphrey, was adopted recommending the passage of a sufficient appropriation to enable the Survey to carry on the valuable work which has been so well begun.

Mr. Albert T. Gridley read the following paper:

Practical Work of Constructing Sidewalks.

By A. T. Gridley, City Engineer, Aurora, Ind.

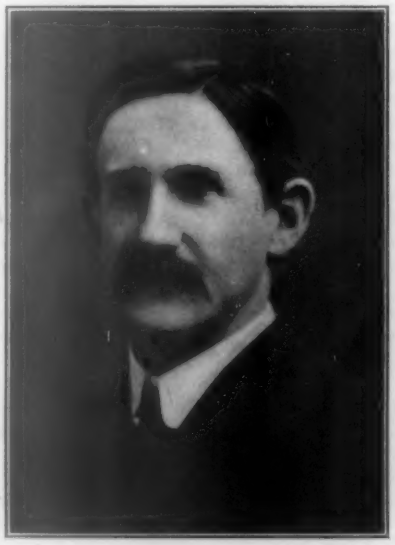
The specifications uniformly given by myself for cement sidewalk paving are: First, excavate to a uniform depth of eleven inches below the finish grade; second, fill with stone-coal cinders (not ashes) seven inches when well rammed to place; when the concrete is ready dampen the cinders to prevent absorption of water from the concrete. Third, on the top of the rammed cinders fill three inches deep with cement concrete prepared as hereinafter described, when thoroughly rammed to place. Fourth, then finish with one inch of fine cement mortar as hereinafter described. The fine cement mortar is made (all parts by bulk) of one part of Portland cement to two parts of clean, sharp sand, mixed dry in a water-tight box. The concrete is made of five parts of durable stone crushed to a three-quarter-inch mesh and thoroughly screened to one part of the aforesaid fine cement mortar. In mixing the concrete first place the stone on a large water-tight platform, then wet thoroughly, then apply the fine cement mortar (dry as yet) and mix until every particle of the stone is coated with the fine cement mortar, and apply to the work at once, thoroughly ramming to place. While the concrete is being rammed to place sufficient of the fine cement mortar should be wet enough to move freely under the trowel, immediately applied to the work, thoroughly troweled down against the concrete, rodded off with a straight edge held so as to compress the mortar and rough-finished with a plasterer's trowel. The work will then be left for the finisher, who will first float the work to a uniform surface and then give it a good polish with the trowel. Gravel with no pebble larger than three-quarters of an inch may be substituted for the crushed stone before named, and where the gravel has sufficient sand of good quality mixed with it, naturally the concrete may be made by mixing the Portland cement, one part to eight, directly with such fine gravel, first dry and then wet only enough to pack solidly and then immediately applied to the work.

Very simple in the telling and quite true, but it doesn't necessarily secure good work, hence we need to consider some of the requisites that cannot be entered up in the written specifications. The first is a council that will stand by the engineer in his efforts to secure good work. The people pay for good work and the Council should see that they get it. The next requisite is a city engineer with a backbone, one sufficiently stiff to discharge an unfaithful workman instanter, and to compel the contractor to realize the very important fact (to him) that good Portland cement work is of less monetary cost than poor work. Very few contractors are practical cement workers; are not in the business for their health, but to make money; and are slow to realize that in this particular case (regardless of other cases) good work has a first cost less than poor work. We will consider some other like requisites further along.

The selection of the materials should be left entirely to the engineer. As to the Portland cement, one can only say that they are all like the toper's whiskey, "good." I have found no such difference as is claimed by the various makers and by many cement users. Different brands work differently, but good results can be had from any. I have found it best to give the workmen that brand

A. MONSTED, MILWAUKEE, WIS.
Fourth Vice-President, N. A. C. U.

CHARLES CARROLL BROWN, IND'PLS.
Secretary, N. A. C. U.



A. S. J. GAMMON, NORFOLK, VA.
Treasurer, N. A. C. U.

W. W. BENSON, WASHINGTON, D. C.
Vice-President, Section of Machinery for Cement Users, N. A. C. U.

with which they best like to work. As to stone or gravel, I can say only that it must be durable. Many kinds of stone air-slake and dissolve out of the work. To say clean, sharp sand is sufficient, but some may not know just what is meant by sharp. It means a sand that shows acute angles under the microscope and so hard that when rubbed between the thumb and fingers none crumbles and no dust forms. It should give a good, sharp, clear ring when handled with a shovel. But let me give you my test. Mix your cement and sand in such proportions as to bring out a plainly discernible slate-green color. If you cannot develop that color, get some sand with which it can be done. With that you are assured of good work, without it you are not. It is the opinion of your writer that more defective work is due to a poor quality of sand than to all other causes combined. Too much insistence can not be made that all the materials must be clean. The entire virtue of cement is in its adhesiveness. If the materials are not clean the adhesion will not take place. This particular applies to the water as well as to the other materials.

Some critic may here say that he has had good work from sand which showed considerable color on the hand and that made the water yellow when thrown into it. Quite true, and quite untrue. The result is apparently, in many instances, better work. But it is only in appearance. The clay which makes this color is not calcined and sooner or later dissolves out of the work with corresponding loss of strength. Many years ago masons and plasterers learned that with a clean, sharp sand and well-burned lime as good results were not had with clean water as with water to which some yellow clay was added and well stirred in before mixing with the lime and sand. It was this very mixture which led to the discovery or invention of Portland cement. These same old-time masons knew that the clay would dissolve out of the work where the work was exposed to the rains. To obviate the difficulty they took the same old Thames mud and burned lime and mixed them, burned them again together, ground them and used them as they had the lime. The work thus produced so much resembled the natural Portland stone that this mixture was called, in turn, Portland cement. The name yet holds good, and the principle yet remains that you cannot make durable work out of unburned clay.

The substructure of the sidewalk may be of the natural surface, crushed stone, gravel or cinders. The essential point is to secure certain drainage. If that cannot be had in any other way, drain tile must be used. Your writer prefers cinders because they part with the water more readily than do other materials and with them there is no tendency to the formation of frost-nails, which are the prime cause of cracking of the work. Just here I want to enter a protest against the use of deep-tongued tools in finishing between the blocks. The usual specifications for dividing the work into blocks are: Divide the concrete into blocks of not more than twenty-five square feet area with a sand joint not more than one-half inch wide. Also divide the finish coat into like blocks with the joints exactly over the sand joints in the concrete with a trowel cut only and finish with a marking tool having a tongue not more than one-fourth inch deep nor more than one-sixteenth inch thick, and joined to the plate with a radius of not more than one-eighth inch. Yet I frequently find men using a marker having a tongue an inch deep and a quarter of an inch thick. The theory for this is that the deep cutting prevents cracking beyond the cut. It doesn't; hence the theory is incorrect. The trowel cut makes a permanent division in the top coat. The shallow marker presses the edges close together, but they do not unite, and so prevents the entrance of water into the joint; hence there is no expansion to push the blocks apart. Great care should be had that none of the dry sand used in making the sand joint in the concrete is permitted to fall upon the top of the concrete. If it does it will prevent the cap, or fine cement mortar, from uniting with the concrete and the cap will be loose and be liable to crack off to that extent.

Among the workmen are some requisites that cannot be written in the specifications. Oftener than otherwise among the common laborers will be found a better stripper than among expert carpenters. It is just a knack in setting the side rails for pavements and backs, fronts and divisions for curbs and gutters, that some men have and others do not. Again, every mason and plasterer knows that there is much in the tempering of the mortar and a good mason or plasterer demands the services of some one whom he considers to be an expert at that work.

It is all in the look and the feel, and some men have the knack for it and others do not. Usually it is best to employ an expert finisher, but, often, among the day laborers will be found a man who will readily get the knack of knowing just when to apply the float and just how to apply the trowel to get a fine finish upon the work. Here is where the city engineer gets in his fine work. It is in being able not to do the work himself, but to select, readily, the men who will do the work. Men do best that which they like best. The engineer should be able to detect that in a man which he likes best, and so can do best, and thus make his own work easy and sure.

To Councilmen I would say, cut out your superintendents. Usually political favorites, rarely with any practical knowledge, and wholly without any legal power, they are more a hindrance than a benefit to the work. Make your engineer responsible for good work. If he needs supervision assistants, let him select them and make him responsible for their acts.

Last, but not least, I want to say something about the tamping and ramming. Both the tensile and the compressive strength of the work are largely dependent upon this one thing and everybody cannot do it. The rammer is usually an iron plate with an upright handle. If this falls but a very little diagonally it stirs up the work instead of compacting it. Among any ten common laborers will be found at least one who will be found to have a knack at droping the rammer square upon the work. He who can do this will have no jar from the handle to his arms and the dread of the tool, which most laborers have, will entirely disappear. Such a man will do twice the work of others and do well where the others do it ill, and do it satisfactorily to himself.

Gentlemen, my story is told, but I want to say something about the future of Portland cement. In crushed and screened "Blue hole" oolitic Indiana limestone, granite, marble and other fine building stones you have the materials, which, combined with Portland cement and suitable sand, will produce better and finer effects in both internal and external architecture, than are produced by the natural stones, and at a much less cost. These artificial stones will receive as fine a polish as the natural stones, if you will but study how it is done.

About Repairs.—Where Portland cement work is brcken, remove the broken part and cut away to a clean surface. Then dampen this clean surface and cover lightly with dry cement and immediately apply the new material which is to take the place of the part removed, and finish as at first. If a part of the work becomes worn and presents a coarse, rough surface, it is because the finish coat was not properly tempered in the making of the work. The best remedy is to take equal parts of unslaked lime and Portland cement, and, within a spell of fine weather, sprinkle lightly all over the worn places and leave it to be kicked about by the feet of passers-by until after a rain. Much surer effects will be attained by making several applications than by applying all at once.

During the discussion Mr. L. F. Perdue gave his successful experience with laying walks on the surface of a clay soil, but the general expression was in favor of thorough drainage and deep enough foundation to insure strength to resist stress by frost in the ground at the sides of the walks, as well as below the foundation.

Mr. Perdue attributed some upheavals of cement walks to beveled joints occurring between shifts on the walk, giving the walk when expanded an opportunity to slide up on the inclined plane thus formed. Another member called attention to long cracks radiating from a post or pole when the walk had been laid too close to it and its free expansion was thereby interfered with. Explosion of walks from expansion is prevented by those reporting by putting in expansion joints at frequent intervals, one making a ¾-inch joint every 100 feet. Trouble with smooth walks being reported, Mr. Gridley stated that his walks are finished with a brush to prevent a glassy surface. He also called attention to the fact that newly made cement will expand more than cured cement. Mr. Seafert said the paper was in error with reference to the origin of Portland cement, as it resulted from the mixture of ground limestone from a roadway with clay in making brick, the resulting product showing unusual cementing qualities. Mr. E. S. Larned recommended that the foundation be extended slightly beyond the neat line of the wearing surface to aid in resisting the force of frost in the adjoining soil. Mr. Cromer objected to the statement in the paper that all Portland cements are good cements, practi-

cal tests showing great differences. Objection was also made to the test of a cement by observing the greenish color in the mixture of cement and sand, this test being of very limited application and not safe for general use.

Mr. G. B. Kirwan then read the following paper.

The Waterproofing of Concrete Blocks

By G. B. Kirwan, St. Louis, Mo.

Our ancestors progressed from the Stone Age to the Iron Age; we seem to be passing from the Steel Age to the Cement, Stone or Concrete Age. We tread on concrete walks, travel in concrete subways, over concrete bridges, live and work in concrete buildings, store our grain in concrete elevators, draw our water from concrete reservoirs and cisterns, sanitate our cities with concrete sewers and are finally buried in concrete cases, deposited in concrete tombs and our numerous virtues are inscribed on concrete monuments.

This gives an idea of the extent to which cement and concrete construction has become a necessary part of our existence and it is probably destined to be the most important feature in the building industry, provided its progress is not retarded by the failure of those engaged in it to live up to the full measure of their oppportunities.

That the cement block system has made enormous strides in a very short time is due to the fact that it is strong and cheap and has great architectural adaptability, but whether this progress is permanent or not depends upon the makers of the blocks, on whom it is incumbent to produce a block that not only combines strength with beauty but is efficient in every particular.

Dampness in buildings is one of the most potent sources of ill health and if concrete block buildings are more damp than those of brick, stone or wood, then the block business will corrrespondingly suffer.

A frame building is necessarily a dry building because in order to exclude cold or prevent the heavy leakage of heat a number of continuous air spaces are created, the enclosing walls of which are nearly always protected by tarred felt or coated building paper, which in itself is, to a degree, impervious to moisture.

It is not claimed that either brick or stone is impervious to moisture, consequently, architects and builders take special precautions to exclude dampness, but most of the makers of concrete blocks assert that the hollow space in the blocks attracts, by the process of capilliary, such moisture as is absorbed by the block, or, the air in the space dries the moisture before it can penetrate to the interior of the building; consequently both architect and builder make no provision to exclude dampness in such buildings, but depend entirely upon the hollow space for excluding moisture.

The reasons why a concrete block building is damp are many:

First. Concrete, whether rich in cement or compressed by hydraulic power will absorb more or less moisture.

No matter in what proportion cement and sand be mixed, the product will be a porous body, and whether blocks are faced, tamped, compressed by hydraulic power, or made rich throughout, the porosity is not destroyed, but merely diminished, therefore the absorption of moisture is not overcome.

Second. The hollow space, not being continuous, does not prove a barrier to the penetration of moisture as it will travel through the solid portions of the block.

With the exception of those blocks in which there are double air spaces, the hollow space does not entirely isolate the inner from the outer face of the block. Double air spaces accomplish this, but a single air space in order to do so must run from end to end, which means practically erecting two walls and creating a continuous air space between them. The system of erecting parallel walls has been for the most part abandoned because a given amount of material will not produce as strong a building, as when it is used in the form of hollow blocks. The object of creating a hollow space is to dampproof and insulate, but a single air space only decreases the amount of dampness and does not exclude it absolutely.

Third—Air in the hollow space is not dry air, but, on the contrary, becomes damp in a short time, thus destroying whatever efficiency the air space might have.

Dampness can result from three different causes, one of which is from poor insulation, resulting in air higher in temperature striking a wall much lower in temperature and condensing. For instance, the air space created by furring and lathing in a brick building is intended to serve two distinct purposes:

It isolates the plastered wall from the

outside wall, thus keeping the plastered wall free from dampness.

The air in the space being a non-conductor, prevents the leakage of heat or penetration of cold, thus maintaining the plastered wall at a temperature high or low enough, as the case may be, to prevent air striking it from condensing.

The theory being that dry air confined will not conduct heat or cold, therefore, in winter artificial heat will remain inside and cold outside, and in summer the heat will remain outside and cooler air inside the building. But, to accomplish this result, the air must be bone dry and confined. On the other hand, if the air is damp it will conduct readily, thus failing as an insulating medium and resulting in a colder house in winter and warmer in summer. If the transmission of heat is heavy enough, then the temperature of the inner face of the wall is steadily reduced until it reaches a point low enough for condensation to begin, when there is a form of dampness which is usually referred to as a "sweaty" wall.

From this it must be deduced that the single air space in a block is of little value as an insulator, because it fails to completely exclude moisture. The double air space in a cement block may prevent dampness resulting from direct penetration, but as an insulator it fails because the air contained in the spaces becomes damp and consequently conducts heavily

Fourth—If moisture is attracted to the hollow space by the process of capillarity then damp air is the result.

Dampness in buildings caused by capillary action has been investigated with great care both by experiment and observation, but as yet it has not been determined what is responsible for this action, nor has it been explained by what process the moisture is attracted; therefore, it cannot fairly be claimed that the air space in a block attracts moisture through the agency of this mysterious force, but even if, through capillarity, the moisture absorbed by the block finds its way to the hollow space, then the air contained in this space becomes damp and the block fails as an insulating medium.

Dampness in buildings results either from direct penetration of moisture through porous bodies resulting from rain beating on the outer face of a wall or from the walls absorbing atmospheric moisture, or from warm air striking a cold wall and condensing.

The reason for dampness caused by direct penetration of moisture is obvious, and that for condensation has already been explained, but why buildings situated on high ground and with apparently dry weather should be damp is not so generally understood.

Water is always present in the atmosphere. Water is soluble in air and when dissolved in it it is as invisible as the air itself; when the proportion of water is greater than the air can dissolve the atmosphere is said to be damp; when the air can dissolve all the water the atmosphere is called dry, notwithstanding that it still contains water.

The proportion of water soluble in air increases with the temperature of the air. When air nearly saturated with water is cooled some of the water is precipitated. During the heat of a warm day the atmosphere may be clear, bright and apparently dry, although it may contain as much water as the air is capable of dissolving at that temperature.

Whenever such air is cooled, as for instance, at sunset, it becomes unable to hold as much water as during the heat of the day and some of the water is discharged, becoming dew, mist or even rain, according to the degree and rapidity of the cooling process.

To demonstrate that moisture is present in air and that dampness is often due to walls absorbing this moisture, it is only necessary to make the following simple experiment.

Take a clean, dry glass bottle and seal it hermetically. Put it in ice and leave it there for about half an hour, then take it out, wipe off the outside and examine it. The inside will be covered with dew, which, if the experiment has been very successful, will form little streams of water and trickle down the sides. By means of a freezing mixture of ice and salt applied to the outside of the bottle, the dew will be transformed into frost. Take the bottle away from the ice, the frozen mixture will thaw quickly and the water will slowly disappear until the bottle has become empty and apparently dry as at first. The bottle was hermetically sealed so that nothing could get in or out, yet the water that appeared in it vanished again. All that was done to produce this result was to change the temperature.

This is what takes place on a small

scale in the bottle. It is closed, but it contains atmospheric air, which contains water. On reducing the temperature some of the water is released and when the temperature is reduced further it freezes. On exposing the bottle to the surrounding temperature the ice within it at first cools the air near the outside and precipitates dew on the outside of the bottle. As the air inside rises in temperature the ice changes to water and then evaporates until the bottle appears as empty as at first. In a similar manner, dry walls become damp and damp walls become wet, small streams of water often trickling down the inside of the building.

F. W. Hagloch, C. E., has paid considerable attention to cement block construction, and in one of his many tests he found that the water absorbed in five hours by six different blocks amounted to so much that the penetration of moisture to the inner face of the blocks was a certainty, and he concluded from this test that some method of waterproofing is a necessity.

The tests made by Mr. Hagloch develop the fact that the hollow space in the block merely minimizes the amount of dampness without excluding it absolutely. In his opinion, making impervious blocks by the addition of sand is almost an impossibility for many reasons, one of which is, to quote him verbatim: "No positive formula can be given owing to the different sands and aggregates and different finenesses of cements requiring different proportions," from which we must conclude that ideal conditions are required, which are almost impossible to obtain.

There is only one way to insulate and damp-proof a building constructed of concrete blocks, and that is to make the blocks impervious to moisture. If this is done, not only is moisture prevented from entering a block, but the air contained in the cells of the block is protected against pressure from the outside; thus the block is constantly filled with air confined in small cells, which is acknowledged by all authorities to be the best non-conductor possible to obtain. Consequently the insulating power of cement and sand mixed in the form of concrete is maintained at its highest point of efficiency, and, assisted by an air space containing bone-dry air, a building easily kept cool in summer and warm in winter must result.

The absorption of moisture by stone, brick, cement or concrete ultimately results either in decay or disintegration, so that if the blocks can be made impervious, the mechanical action of water constantly rubbing against the particles of concrete and loosening them, thereby disintegrating the mass, or the action of chemically-charged moisture, which is responsible for decay, is entirely prevented.

If blocks could be troweled and finished off in a similar manner to sidewalks, there would be practically no penetration, but as this is impracticable in all cases where the object is to produce an imitation of rough-hewn stone, some other means must be adopted. The simplest method would seem to be to apply a waterproofing liquid that will fill the pores of the stone and render them impervious to moisture. At the same time it must neither injure the ingredients of the block or discolor the surface. It must not be affected by frost or drawn to the surface and evaporated by the heat of the sun. Various chemical compounds have been recommended and are being used by the makers of blocks, but in applying a waterproof coat care must be taken not to affect the strength or otherwise injure the blocks. The only material that is insoluble in water, that will resist chemical action, and, at the same time, will not injuriously affect concrete, is paraffine. The chief drawback to paraffine is that it requires mechanical means to apply which would so increase the expense of block making as to be practically prohibitive. If a vehicle can be found that will combine with paraffine so that the mixture can be applied without mechanical means; that is, simply with a brush like ordinary paint, then, in my opinion, the problem of making concrete blocks absolutely impervious to moisture will be solved.

A paper by Mr. W. H. Finley on "The Waterproofing of Concrete Structures" was read by the secretary in the absence of the author. It was as follows:

Water Proofing Concrete Structures.

By W. H. Finley, Principal Assistant Engineer, C. & N. W. Ry.

Ever since concrete has entered so largely into the field of construction as a substitute for stone masonry there has been more or less discussion as to its permeability and various expedients have been resorted to to prevent the seepage

of water through the material. This refers more particularly to the large masses of concrete built for engineering structures. I am aware that there has been more or less success in making concrete impervious to the action of water by various means, but do not think that any of them have given such satisfaction as to become generally used.

It is a question whether the addition of alum, soap and other extraneous material does not affect the lasting qualities of the concrete. If the announcement of the "Star-Settin" Portland Cement Works that they are now manufacturing, according to a process invented in Germany, a waterproof cement which will become impervious to water, will resist the action of frost, heat, hot water, sea water and diluted acids, is borne out, the question of waterproofing concrete is settled for all time. However, concrete, as usually built in many engineering structures, is not impermeable to the action of water and some method of waterproofing the same, I think, is vitally necessary. That this is appreciated by engineers is clearly evidenced by the amount of waterproofing that is now being done on concrete arches, abutments, retaining walls, etc.

The writer has recommended for years the necessity of waterproofing both stone masonry and concrete structures where there was any danger of seepage of water, and believes that such a precaution will extend the life of the structure.

A recent examination of concrete abutments, retaining walls, etc., built in Chicago some years ago, disclosed the fact that water was seeping through the mass in several places, particularly along the parting planes where the work was not carried on continuously. This condition is frequently observed in concrete construction, and I think could be entirely prevented if the back of the structure was thoroughly waterproofed with asphalt.

Some years ago I had occasion to repair some masonry arches built in 1862 that were rapidly disintegrating owing to the infiltration of water. These arches were uncovered, the damaged stone replaced and the extrados of the arches were plastered with cement concrete and then thoroughly waterproofed with asphalt. Time has demonstrated that this work was very successful. I have since uncovered a number of arches that were leaking and found the concrete backing did not prevent the entrance of water. These were cleaned off and waterproofed with asphalt in each case. It is now the practice on a number of railroads to thoroughly waterproof all arches, abutments, retaining walls, etc. The method generally employed is to use as a first coat asphalt cut with naphtha, to be applied as a paint to the concrete after the same is perfectly dry, and then cover the surface with an asphaltic mastic composed of one part of asphalt to four of sand; this to be smoothed off with hot smoothing irons and thoroughly tamped and pressed into place. If the filling over the arch is ordinary gravel or dirt no other work will be necessary, but if it is filled with broken stone or stone chips it is better to cover the surface of the asphalt with washed roofing gravel, so that the broken stone will not cut or damage the asphalt surface. There are various other methods employed in waterproofing concrete surfaces with asphalt, such as the use of burlap or other fabric imbedded in the asphalt coating. It is very difficult to make hot asphalt adhere to a concrete surface however dry the same may be, unless it is heated by artificial means. Hot asphalt laid on ordinary dry concrete will not adhere and can be rolled up like a blanket after it has cooled. The writer has had some success in applying hot asphalt direct to concrete surfaces after the same had been dried and heated with hot sand, but much prefers the use of the asphalt cut with naphtha applied as painting or as swabbing coat. The cost of this work, with present prices of first-class asphalt, will range from 10 to 20 cents per square foot, depending upon local conditions. It does not require any special expert knowledge for its application. After a brief coaching the forces as usually employed can produce a satisfactory job.

It might be well at this time to say something about the quality of the asphalt to be used for waterproofing purposes. In the past few years there has been a large development of asphalt for this purpose and it is now possible to get at a reasonable price a pure asphalt that will not flow under a temperature of 212 degrees and not become brittle when it is spread thin on glass at 15 degrees below zero. Also, it will resist the action of acids and alkalies.

The following specification is one that I have used with good results in waterproofing works:

1. Material—(a) Asphalt shall be used which is of the best grade, free from coal tar or any of its products, and that will not volatilize more than ½ of 1 per cent under a temperature of 300 degrees F. for 10 hours.

(b) It must not be affected by a 20 per cent solution of ammonia, a 35 per cent solution of hydrochloric acid, a 25 per cent solution of sulphuric acid, nor by a saturated solution of sodium chloride.

2. Range of Temperature—(a) For metallic structures exposed to the direct rays of the sun, the asphalt should not flow under 212 degrees F. and should not become brittle at 15 degrees F. below zero when spread thin on glass.

(b) For structures underground, such as masonry arches, abutments, retaining walls, foundation walls of buildings, subways, etc., a flow point of 185 degrees F. and a brittle point of zero will be required.

(c) The asphalt covering must not perceptibly indent when at a temperature of 130 degrees F. under a load at the rate of 15 pounds per square inch, and it must remain ductile at a temperature of 15 degrees F. below zero on metal structures and at zero F. on masonry structures underground.

3. Preparing Surface—(a) Before applying asphalt to a metal surface it is imperative that the metal be cleaned of all rust, loose scale and dirt, and if previously coated with oil this must be burned off with benzine or by other suitable means. The metal surface must be warm to cause the asphalt to stick to it and the warming is best accomplished by covering it with heated sand, which should be swept back as the hot asphalt is applied.

(b) When waterproofing masonry structures, if the surface cannot be made dry and warm, it should be first coated with an asphalt paint made of asphalt reduced with naphtha. This is particularly necessary for vertical surfaces.

4. Preparing Asphalt—The asphalt should be heated in a suitable kettle to a temperature not exceeding 450 degrees F. If this is exceeded it may result in "pitching" the asphalt. Before the "pitching" point is reached, the vapor from the kettle is of a bluish tinge, which changes to a yellowish tinge after the danger point is passed. If this occurs the material should be tempered by the addition of fresh asphalt. The asphalt has been cooked sufficiently when a piece of wood can be put in and withdrawn without the asphalt clinging to it.

5. Application of Asphalt to Metal Surfaces—(a) The first coat should consist of a thin layer poured from buckets on the prepared surface and thoroughly mopped over.

(b) The second coat should consist of a mixture of clean sand or screenings, free from earthy admixtures, previously heated and dried, and asphalt in the proportion of 1 of asphalt to 3 or 4 of sand or screenings by volume; this is to be thoroughly mixed in the kettle and then spread out on the surface with warm smoothing irons, such as are used in laying asphalt streets.

(c) The finishing coat should consist of pure hot asphalt spread thinly and evenly over the entire surface, and then sprinkled with washed roofing gravel, torpedo sand or stone screenings to harden the top.

(d) The thickness of the coating will depend on the character of the work and may vary from ¾ inch to 2 inches in thickness.

6. General—Where a quantity of asphaltic concrete is required, such as in trough floors on bridges, a concrete should be made in the proportion of 1 part asphalt, 2 parts sand and 3 parts limestone screenings, thoroughly mixed and rammed into place with tamping irons on the first coat of pure asphalt with which the metal was originally covered. At all drainage holes large-sized stone should be carefully placed by hand to insure perfect drainage.

It may not be out of place in discussing the question of waterproofing to call attention to the necessity for provisions for drainage in all concrete and masonry structures. This has not been given as much attention as it should receive. Whether waterproofing material is applied or not, the question of thoroughly draining the structure is of the greatest importance.

In ordinary building construction sufficient attention has not been given by architects and builders to the proper waterproofing of their foundation walls. I have observed recently in this vicinity a number of buildings in process of construction where the excavations for the cellar and lower foundations were made in a clayey material and concrete foundation walls put in without making any attempt to apply a waterproofing or damp-

proof coating to the wall or provide suitable drainage to carry off the ground water.

In this particular we are falling away behind even the early Roman architects and builders. In all the examples of their work it is evident they gave the greatest consideration in their construction to proper methods for keeping their foundation walls dry, and we cannot do better today in such matters than follow the advice of the great architect Vitruvius, who, writing about 25 years B. C., described methods of waterproofing and ventilating foundations walls that compare favorably with the best methods used today, excepting that we may have better materials for waterproofing than were known at that time.

Asphalt, I believe, makes the best damp-proof or waterproofing material that can be used in foundation walls and for all structures where such provision is necessary. It has been used from the earliest times for the purpose of protecting material from air and water and we have examples of it in our museums where the mummy cases were sealed with this material more than 3,000 years ago.

I think the various makes of hollow concrete block offer a good field for the application of waterproofing. It is in line with the ideas of the early Romans in building hollow walls to take care of the question of dampness. I am of the opinion that these blocks laid up in asphalt and the surface next to the ground thoroughly coated with the same material make an ideal damp-proof wall.

I have found that the waterproofing qualities of asphalt, even when used under water pressure, are all that could be desired. When repairing a stone reservoir recently the following method was used: A single course of brick was laid up in the front of the wall, this brick being heated until the moisture was driven out, and then soaked in hot asphalt and laid in place, the space between the brick and the stone being filled with an asphaltic concrete of limestone screenings and asphalt in the proportion of about 1 to 4. These brick were anchored into the stone wall at intervals and the work has given very good satisfaction.

Mr. Noyes F. Palmer of Brooklyn, N. Y., contributed to the discussion a description of the method of waterproofing blocks used in a building in Philadelphia. Eight pounds of alum were put into one barrel of water and a "box" of castile soap into another. When thoroughly dissolved these were used in equal parts to wet the mixture for the blocks. Mr. A. C. Horn reported the ultimate failure of the same process on a building in New York, although it was successful in making the old Forty-second-st. reservoir water-tight.

On Wednesday evening the convention members were the guests of the Indianapolis Commercial Club at its rooms and were entertained very happily by speeches from members of the club and attendants of the convention, as well as by refreshments. The social portion of the evening extended to a late hour and every expression heard was of satisfaction at the treatment received. Special commendation was heard on every hand of the very happy manner in which Mr. Alfred F. Potts presided for the club over the more formal speech making of the evening. Several of the newly elected officers of the society were heard and there were also speeches from men in all the various lines of the use of cement, represented in the convention.

Upon calling the session of Thursday morning to order, President Given called First Vice President Goetzmann to the chair and spoke from the floor substantially as follows:

Mr. Chairman and Gentlemen of this Convention: I know that I voice the sentiments of every man upon this floor when I say that we are all proud of this association so far. We have made great strides and the proceedings have been eminently satisfactory, I think, to the majority of us.

You gentlemen have honored me with selecting me as your temporary chairman, a compliment which I assure you I appreciate, and you have also further honored me with the selection of me as your permanent president, an honor which I also highly appreciate, and I want you all to feel that I appreciate it. I have thought that I had your hearty and earnest support in my rulings. It would be impossible for me to express to you my sincere thanks for all these good things which you have showered upon me. I have been honored as much as any man could have been honored and more than I deserve.

In looking over the constitution and by-laws which have been adopted by this association, I find that officers shall enter upon the duties of their respective positions as soon as the business of the annual meeting at which they are elected is finished.

The business of this assembly will be finished at the close of the last session.

And I have a proposition to make and a suggestion, if you please, that at the close of this session you will elect a gentleman among you whom I would like to recommend as president for the ensuing year so that it will not be required of me to hold during this session and the session of the coming convention.

Honors are appreciated by all intelligent men and I believe that it is wise, gentlemen, to pass these honors around, and especially to those who are competent and who are worthy of the honors

We have in our midst a gentleman whom I know you will be proud to honor; a man who is prominent in all work connected with the cement industry; a man who is not allied; a man who is independent absolutely; and a man of ability, and a man who will add credit and honor to this institution. If you will permit me as retiring President of this association to name this gentleman, I will consider it a further kindness. The gentleman to whom I refer is Mr. Humphrey, to whom you have all listened and every man who has sat under the sound of his voice has been benefited by his being here among us. I thank you, gentlemen, kindly for all the kindness and the honor you have bestowed upon me and ask that you consider my proposition.

After some inquiry as to the parliamentary form of accepting the suggestion of Mr. Given, Mr. William Fortune said.

I beg leave to say a few words. Mr. Given has showed by his action here this morning a breadth of mind and magnanimity of spirit that I should think would challenge the admiration of all here who have the interests of this organization at heart. He is the president of this organization, elected by an overwhelming vote in recognition of his abilities and the services he has rendered in bringing this organization together.

If it is his wish to retire, as he states, for the purpose of passing the honor to another man so that he will not serve through two sessions of this organization instead of through one, an honor that would not fall to any succeeding president, let us honor him in this way. When Mr. Given comes before us with this magnanimous proposition on his part I feel as one that it is a favor, a very large-minded and generous thing on his part to do, and that we, if we are disposed to accede to his wishes and accept another man as president, should do it in the same spirit that Mr. Given himself has placed before us.

It is not a question of resignation. Mr. Given has not offered his resignation, as I understand it, but he would retire as president of this organization, honoring another man who has been mentioned in connection with this position—the only other man whose name has been brought forward on this floor.

It is, gentlemen, as I say, the most magnanimous thing to do, and it shows that Mr. Given has the welfare of the organization at heart, which he has helped to start. If it is our wish to permit this change to be made let us do it with as much credit to ourselves as Mr. Given showed in making the offer.

Mr. Merrill Watson said:

Mr. Given, as Mr. Fortune has said, has made a most magnanimous offer, and let us see if we cannot properly understand the situation. Mr. Given, in that magnanimous style of his, proposes not to resign, but to retire, not in advance of the hour and day of his election, but at the close of this convention, and to allow a permanent president to be elected for the ensuing year. I have not seen anywhere in my fifty odd years of life a more magnanimous offer than this. I desire, therefore, to make this motion, that the offer of retirement of Mr. Given as president at the close of this convention that another may be elected for the following year be accepted.

When this was modified to instruct the executive board to accept the retirement of Mr. Given and elect Mr. Humphrey as his successor, after the close of this convention, that the action might conform with parliamentary requirements, it was unanimously adopted.

Col. Cromer of Logansport presented some suggestions of amendments to the constitution, which were referred to the executive board with instructions to report them in proper form at an afternoon session.

Mr. J. A. Mitchell's paper on "Cement Posts," not being in the room, it was read by title and ordered spread on the minutes. It follows:

Cement Posts.

By J. A. Mitchell, Goshen, Ind.

In presenting this paper upon the subject of cement posts, I speak from practical experience, and will briefly give my views upon the subject. The knowledge I have of cement posts was obtained from an experience of over three years in the manufacture of them.

The scarcity of timber suitable for fence posts has brought the question of using cement for posts to the front. In treating upon the subject of cement in fence posts I shall put it under several different heads. The practicability of cement posts, mixing material, reinforcing, fasteners for fence, molds, age before using, cost of manufacture, effect

of cold or heat on the posts and test of strength.

Practicability—It has been demonstrated in a number of localities that cement fence posts are a success, when properly constructed. I have seen cement posts that have been in the ground for over ten years and they were better than when first set. One hitching post I know that has been in constant use for twelve years is still perfectly sound. I have made thousands of cement posts, some of which have been set in the ground for over three years. I have never known a post to be broken after it was once set in the line of fence. After an experience of over three years of experimenting with and manufacturing cement posts I am convinced that they are the coming posts for fence purposes. They are practically indestructible as regards the elements.

Mixing Material—Regarding the mixing of material for posts, I will say that I have used both the dry and the wet or slush mixture in the manufacture of the posts, and have obtained good results from both, but I must say that I have made the neatest and the best posts with the dry mixture, but it is a much slower way of making posts than by the wet mixture.

As to the proportion of cement and sand used in making posts one must be governed by the quality of sand used. I have used one to three, one to four and even one to five with varying results. There is such a thing as making a mixture too strong of cement. I tried half sand and half cement and the posts made in that way were an entire failure from some cause that I could not account for.

Reinforcing—A very essential feature in the manufacture of cement posts is the reinforcing. It is next to impossible to make a post without some sort of reinforcement and the success of your posts depends greatly upon the kind of reinforcement used. It is a mistaken idea that almost anything will answer for the interior of the post. Wood has been tried, but it positively will not do for the strengthening of cement posts. I have seen it tried at different times in the past seven years, but it has always resulted in failure. Metal is the only practical strengthener for reinforcing cement posts, and care must be used in selecting the proper kind of metal. Galvanized metal should be used, round in shape. It is very hard to get a good post when flat metal is used. I have tried all kinds and find the round iron the best. Corrugated rods are very good.

Fastenings for Attaching the Fence to Posts—This is the one thing that has puzzled the manufacturer or would-be manufacturer of cement posts. Holes through the post were the first device for fastening the fence, but there are two objections to the use of holes in the post. One is that the holes weaken the post and the other is it takes too long to make the holes in the post and the time required in putting ten holes in each post will amount to the time required to make the post. Eyes made of wire, hooks and staples imbedded in the cement have been tried for fasteners, but I find that the best fastener is the one that fastens the fence and post firmly and rigidly together. If the fence and post are so fastened together that it is impossible to move the post with the line of fence it is a great benefit to the post, as with such fastener it is almost impossible to break the post with the line of fence.

Molds—From the experience I have had, wooden molds are the best for forming the cement post. They are light, easily and cheaply made and last a long time if kept in the dry or under cover. The double mold, or two posts to the mold, I have found best, and the mold should be collapsible so that the post can be removed from mold in from 24 to 48 hours after making. I have molds that have been in use for three years and they are good yet. Molds cannot safely be removed from the post until the concrete is set. The shape of the post renders it very liable to crack if handled before the cement sets. Iron molds are too heavy to handle and too expensive.

Age of Post Before Use—From practical tests I find that posts can be safely set in line of fence at the age of 30 days, yet 60 days is better and it would be still better if the post could be kept for six months before setting in line of fence, for they would then be thoroughly cured, seasoned and hard, although I have set posts that were only two weeks old with good results, but it is very risky setting and shipping them at that age. Posts are called thoroughly cured in 60 days, but I find them at the age of one year three times as strong as at 60 days.

Cost of Manufacture—Posts can be manufactured at a cost of from 11 to 12½ cents each, counting cement at $1.50 per

barrel, gravel at 40 cents per yard, metal at 2¾ cents per pound and labor at $1.50 per day. Some persons who are selling farm rights represent that posts can be made for 7 cents, when the cement alone costs 5 to 6 cents. Two men will make 100 posts per day, while three good men can make 175 to 200 per day. The more men that are used working together, the less the cost per post for labor.

Effect of Cold or Heat—It has been a question with some persons as to whether a cement post would stand freezing weather, they contending that a rainy, sleety time followed by a hard freeze would burst the post on account of the post taking up so much water, but this is a mistaken idea. I have put the posts to all kinds of tests and exposed them in every way to all kinds of weather. I have set them in the ground where the water would stand of a wet time and have had it freeze to a depth of two feet or more where this water stood without affecting the post in the least. I have left them lying on the ground singly and in stacks all winter; have known an inch and a half of ice to freeze on top of a pile of posts, and I have cut the ice off of the top of a pile of posts that I wanted to ship and found them in the best condition. These tests of cold were made in Michigan, where they had ice last winter two feet thick. I shipped three car loads in January, 1904, that the workmen had to shovel over two feet of snow off of and then cut at least an inch of ice from the top layers. In this lot of 1,600 posts there were 8 damaged posts, and they were not damaged so much but what they were used and we were allowed half price for them. The cold weather has no effect on them whatever, neither does the heat. I burned some pieces of a broken post in my stove last winter all winter, using them for firebrick, and they were as good in the spring as they were when I put them in the stove. One great advantage of cement over the wood post is that there is no danger of burning the post if the fence row burns out, as if often the case along railroads.

Strength—I have tested the strength of the post in several different ways. Have tested them in the line of fence, the end posts with a pull of at least five tons without breaking. Have had them tested with the best wire fence stretchers that are in use with 55-inch fence of hard steel galvanized wire, and never had a break. I have tried them with something under each end and a dead weight of over 800 pounds between the supports without breaking. Have put them to a scale test by using one as a lever with the fulcrum on the platform of scales, the scale beam showing a weight of over 700 pounds without breaking. They stand shipping splendidly and they can be hauled any distance and over any kind of road.

In conclusion I will say that after an experience of over three years in the manufacture of cement posts, they are a success as a post and they can be manufactured and sold at a good profit and at a price lower than is asked for a good wood post. The main thing is in knowing how to make them. I have had no trouble in selling all the posts that I could get made and at a good price, retailing them at 30 and 35 cents for the small or line posts and $3 each for the end and corner posts.

In the absence of the author, the following paper was read by the secretary:

Mortar Sand

By J. C. Hain, Engineer of Masonry Construction, C., M. & St. P. R. R., Chicago, Ill.

Can anything new be said about sand? The less experienced know what sand is suitable for mortar, and what is not. The Romans made a concrete 2,000 years ago and were familiar with the requirements of a good sand, one of its important ingredients. Clean, coarse, sharp sand is generally conceded to be the best. With this in view, it is not surprising that apparently little can be said. Although the subject may seem to have been decided thousands of years ago, I still believe there is much to be learned. I can best illustrate my stand by calling your attention to a few sands, with more or less peculiarities, and compare their laboratory tests with a standard.

Allow me briefly to explain the conditions which led to these tests. The bridge department of the Chicago, Milwaukee & St. Paul Railway Company, Mr. C. F. Loweth, Engineer and Superintendent, with whom I am employed in charge of the masonry, requires large quantities of sand in its substructures and culverts, which are built principally of concrete. In the last six years we used a maximum per year of about 85,000 barrels and a minimum of about 50,000 barrels of ce-

ment. This will give you an idea of the amount of sand required yearly. The sand comes from numerous sources over the entire system of 7,000 miles, most of which are company sand pits. The problem before us was one of selecting the most suitable sand with the least haul. This led to laboratory tests of questionable sands. In many instances these tests were a great surprise to us. I will call your attention to some of the most peculiar of these.

Before doing so, I will briefly explain the tests. A 1 to 3 mixture was used throughout, except where neat cement is specified. Each tensile test represents the average of three briquettes, except in cases where one appeared exceptionally irregular, in which case it was thrown out. The different sands are grouped in the tabulation because each was tested with a different lot of Portland cement, as well as a different sample of the St. Paul standard sand. For these reasons, not only the test in pounds is given, but also the percentage any test is of the corresponding standard test. Thus the percentages give a basis of comparison between the sands of different groups. The neat tests are also shown for comparison. All tests were extended to three years. Those not shown are still to be made.

One of the early questionable sands which needed our consideration was a bank sand of glacial deposit, found near Elkhart Lake, Wisconsin, tests of which are tabulated. On first observation its fineness seemed to be the greatest objection. It contained some coarse particles, but the fine ones were in excess. Ninety-two per cent passed through a No. 50 sieve, while only 54 per cent and 11 per cent, respectively, of the St. Paul Standard passed through these same sieves. In other words, on these two sieves, Elkhart Lake sand showed up twice as fine as the standard. However, on closer examination a more striking peculiarity developed, which seemed even more objectionable than its fineness. Apparently the sand bank was a deposit of broken shells, because it could be easily ground into very fine particles by rubbing them between two hard objects. When examined under a microscope it appeared to consist of fine grains of silica with rounded, smooth surfaces, mixed with larger particles of softer material with sharper corners which probably consisted of shells or a soft limestone. (Evidently the silica crystals had been worn round and smooth before the shell-like mixture was added.) While the larger chalk-like particles seemed to be soft, the silica was also easily crushed, but not so readily. When treated with hydrochloric acid it gave off a strong effervescence, indicating that we were probably correct in the supposition that it contained shells or limestone.

We had a particularly important job in the near vicinity where we wanted to use this sand, because this was the only available pit for several hundred miles. Though sand from this pit had been used for building purposes for years, the question arose whether we were safe in using it for the concrete center pier of a draw span. A laboratory test was made in connection with our St. Paul standard sand for comparison. The results are shown in the table. While the Elkhart Lake sand tests vary from 60 per cent to 90 per cent of the standard, it averages throughout the tests up to two years about 73 per cent of the standard, which is a very good showing, considering everything. To make the comparison clearer, Ottawa sand, which was favorably recommended by the American Society of Civil Engineers, as a desirable standard, developed an average strength of 80 per cent of our standard, up to two years. From this it appears that the fine shell-like sand from Elkhart Lake differs only by 7 per cent from the standard sand recommended by the American Society. At all events we decided to use it for the important job above referred to. The center pier in question was built from it and the pier stands today as an excellent piece of concrete work which has plenty of life and ring.

My opinion of this soft, fine sand has improved. The laboratory tests were much better than I expected. The character of the concrete made from it appeared to be all that could be desired. An excessive haul was saved by using it. On the other hand, I am not in favor of using a sand of this character without first making laboratory tests. All soft, fine sands do not act alike.

Another sand in this same glacial district which was still more of a surprise than the above, was the Pound sand, tests of which are platted and tabulated. Its noticeable peculiarity was the presence of foreign material resembling clay. The damp sand when taken from the face of the bank was plastic and readily

caked in the hand like putty. The particles of silica were held together by the clay. A coating of fine material clung to the hand after handling it. To one accustomed to the usual specifications for a clean sand, free from foreign substances, this would fall far from being satisfactory. Laboratory tests were made, extending to three years. These tests, to our surprise, proved to be superior in every respect to our standard sand. The 7 and 28-day tests of this were respectively 40 per cent and 30 per cent above the standard. The difference became less with age, although the three-year test was 20 per cent above the standard. This surely was contrary to the then general impression of a good sand, especially at the time these tests were started. The sand was found to contain 7.7 per cent of fine material by decantation; that is, material held in suspension, all of which was perhaps clay. There appeared to be no other peculiarity, and hence it was thought that this clay was beneficial to the sand. At all events, the sand tested so well that it was considered perfectly safe to use it for ordinary concrete purposes. The question of using it under water, where clay might retard the setting, was not gone into.

I wish next to call your attention to Eagle No. 1 and No. 2 sands, shown in the diagram and tabulation. The former contained 3.2 per cent of material held in suspension, while the latter contained 15.7. Eagle No. 1 was selected for the best sand in the pit and No. 2 for the poorest. Both sands seemed questionable. Before tests were made we even doubted the advisability of using any sand from this pit, but decided to order out a shipment of the best (No. 1) for an unimportant job and follow with tests. The tests proved the unexpected. To our surprise, both tested well, and what was a still greater surprise, the No. 1 Eagle, which contained 3.2 per cent of clay, showed up poorer than the No. 2, which contained 15.7 per cent. The particular sample of St. Paul standard sand with which they were compared contained 3.4 per cent of material held in suspension, largely clay. The strength of all three sands, while irregular, appeared to be governed largely by the amount of material held in suspension, or, in other words, the amount of clay. We surely were mistaken in our first estimate of these sands.

Still another test, which proved the superiority of clay in sand in a different way, was the Jackson (Minn.) pit sand, one sample of which was washed and one not. The unwashed showed up about 25 per cent superior, although it contained 6 per cent of clay. On the other hand, the washed sand averaged considerably below our standard, about 30 per cent, and the unwashed a trifle below, though very close to it. This comparison to the standard sand is contrary to what we found in the previous sands from the Eagle pit, because the unwashed Jackson sand, which contained 6 per cent of clay, did not test better than the standard sand, which contained only 1 per cent. But, looking further, however, and comparing the fineness of the Jackson and standard sand, as per tabulation, it will be seen that the standard is a much more desirable mixture of fine and coarse particles, which the writer believes accounts for the discrepancy, and which will be touched upon later. This is another example where the presence of clay improved the sand.

The above tests of sands containing clay in their natural state, as well as many others which I have not taken time to mention, tend to prove that the presence of small percentages of clay is not objectionable, but, on the other hand, may be desirable. This, however, does not prove that sand containing ordinary soil is better than one without it. To decide this, we made a series of tests of washed sand to which was artificially added 2, 5, 10 and 20 per cent of rich surface soil consisting principally of decayed organic matter. The soil was taken from the bank of the Chicago River, where undisturbed weeds had thrived and decomposed season after season, and had made the richest kind of soil. The results were disappointing. They were neither decidedly inferior nor superior, but proved quite irregular. The tests up to two years showed that at some period they were above the sand containing The percentage of soil added did not cause the tests to follow any definite law. The 20 per cent adulteration had comparatively little different effect than the 2 per cent. As a whole, the average strength of the tests up to two years was about the same as the clean test, but the irregularity was so great as to make the artificial sands less desirable than the natural. The diagram will make this clear. It would seem from this that sands with a small admixture of soil ought not be condemned without first

TENSILE AND FINENESS TESTS OF SAND.

Sand.			Seven days.		Twenty-eight days.		Three months.		Six months.		One year.		Two years.		Three years.				Per cent. by weight of sand passing through and held between the following sieves.										
Name.	Deposit.	State.	Tension in pounds.	Per cent. of standard.	Tension in pounds.	Per cent. of standard.	Tension in pounds.	Per cent. of standard.	Tension in pounds.	Per cent. of standard.	Tension in pounds.	Per cent. of standard.	Tension in pounds.	Per cent. of standard.	Tension in pounds.	Per cent. of standard.	Average per cent. of standard.	Per cent. by decantation (held in suspension).	Per cent. through No. 8.	Per cent. between Nos. 8 and 12.	Per cent. through No. 12.	Per cent. between Nos. 12 and 24.	Per cent. through No. 24.	Per cent. between Nos. 24 and 50.	Per cent. through No. 50.	Per cent. between Nos. 50 and 100.	Per cent. through No. 100.	Per cent. between Nos. 100 and 200.	Per cent. through No. 200.
GROUP I.																													
Elkhart Lake	Glacial	Wis.	105	71	174	99	220	69	268	71	258	60	279	82	....	....	73	0.9	100.0	0.5	99.5	7.2	92.3	64.6	27.7	23.5	3.8	2.9	0.9
"St. Paul Standard"	Glacial	Ill.	147	....	176	....	319	....	379	....	433	....	340	....	....	....	....	0.9	100.0	14.9	85.1	31.6	53.5	42.3	11.2	8.7	2.5	1.1	1.4
Neat Portland Cement	....	....	667	....	699	....	838	....	887	....	757	....	752	....	....	....	....	....	....	....	....	....	....	....	99.3	9.8	90.0	14.5	75.5
GROUP II.																													
Eagle, No. 1	Glacial	Wis.	128	108	185	97	239	98	302	105	328	108	332	92	382	102	101	3.2	No fineness tests made.										
Eagle, No. 2	Glacial	Wis.	141	118	208	109	278	114	342	119	392	129	442	123	472	126	121	15.7											
Pound	Glacial	Wis.	166	139	248	130	299	123	357	124	413	136	429	119	445	119	126	7.7											
Rockton	Glacial	Ill.	116	97	147	77	209	86	241	84	240	79	283	79	....	....	82	2.5	100.0	3.6	96.4	21.4	75.0	55.0	20.0	10.0	10.0	8.0	2.0
"St. Paul Standard"	Glacial	Ill.	119	....	191	....	243	....	288	....	303	....	360	....	373	....	....	3.4	100.0	13.5	86.5	31.7	54.8	41.1	13.7	8.8	4.9	1.2	3.7
Neat Portland Cement	....	....	533	....	596	....	629	....	646	....	632	....	737	....	744	....	....	....	....	....	....	....	....	....	99.4	8.3	91.1	11.5	79.6
GROUP III.																													
Jackson (not washed)	Glacial	Minn.	185	116	223	81	290	88	359	88	377	91	428	99	....	....	91	6.0	100.0	10.3	89.7	62.5	27.2	25.0	2.2	1.2	1.0	0.7	0.3
Jackson (washed)	Glacial	Minn.	140	88	181	65	227	69	285	58	303	73	314	72	....	....	69	0.0	100.0	6.3	93.7	49.4	44.3	34.3	10.0	9.2	0.8	0.3	0.5
"St. Paul Standard"	Glacial	Ill.	159	....	277	....	330	....	406	....	413	....	433	....	....	....	....	1.1	100.0	9.2	90.8	34.4	56.4	47.4	9.0	7.7	1.3	0.6	0.7
Neat Portland Cement	....	....	654	....	710	....	743	....	687	....	818	....	925	....	....	....	....	....	....	....	....	....	....	....	99.6	8.9	90.7	13.9	76.8
GROUP IV.																													
"St. Paul Standard" (washed)	Glacial	Ill.	....	....	292	....	361	....	384	....	430	....	435	....	493	....	....	0.0	100.0	6.3	93.7	49.4	44.3	34.3	10.0	9.2	0.8	0.3	0.5
"St. Paul Standard" (2% soil)	Glacial	Ill.	....	....	257	....	390	....	418	....	458	....	431	....	479	....	....	2.0	Same sand used with exception of soil that was added.										
"St. Paul Standard" (5% soil)	Glacial	Ill.	....	....	248	....	348	....	352	....	491	....	414	....	422	....	....	5.0											
"St. Paul Standard" (10% soil)	Glacial	Ill.	....	....	242	....	335	....	379	....	506	....	417	....	499	....	....	10.0											
"St. Paul Standard" (20% soil)	Glacial	Ill.	....	....	299	....	334	....	368	....	515	....	414	....	431	....	....	20.0											
Neat Portland Cement	....	....	....	....	825	....	841	....	712	....	735	....	713	....	834	....	....	....	....	....	....	....	....	....	....	....	....	....	....
GROUP V.																													
Excavated Kansas City	River	Mo.	52	34	92	40	141	34	244	77	263	77	....	....	....	....	61	11.9	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	6.8	93.2
Missouri River Kansas City	River	Mo.	120	78	174	77	261	100	306	97	312	92	....	....	....	....	91	0.3	100.0	0.0	100.0	2.0	98.0	82.5	15.5	14.0	1.5	0.5	1.0
"St. Paul Standard"	Glacial	Ill.	153	....	227	....	261	....	315	....	340	....	....	....	....	....	....	1.1	100.0	9.2	90.8	34.4	56.4	47.4	9.0	7.7	1.3	0.6	0.7
Neat Portland Cement	....	....	555	....	627	....	650	....	741	....	712	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	92.5	19.3	73.2
GROUP VI.																													
Fine Track Elevation	Wind	Ind.	....	....	170	58	201	55	201	52	271	63	243	56	238	59	58	0.3	100.0	0.0	100.0	0.0	100.0	5.7	94.3	83.2	11.1	10.9	0.2
"St. Paul Standard" (washed)	Glacial	Ill.	....	....	292	....	361	....	384	....	430	....	435	....	493	....	....	0.0	100.0	8.2	91.8	34.5	57.3	48.5	8.8	8.0	0.8	0.4	0.4
Neat Portland Cement	....	....	....	....	689	....	667	....	727	....	801	....	604	....	727	....	....	....	....	....	....	....	....	....	....	....	93.7	....	....
GROUP VII.																													
Possible Ideal Sand (in fineness)	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	100.0	60.4	39.6	24.1	15.5	9.6	5.9	3.8	2.1	1.5	0.6

making tests, but, on the other hand, it is not as desirable as one without soil. Sands of this character (ones containing soil which consists of decomposed vegetable matter) are rarely found in nature. The soil simply overlays the sand pits, and can be easily stripped off. A rare case of river deposit might occur which contained soil, though this is contrary to expectation because of the difference in specific gravity of the sand and soil. The two are seldom deposited together. The natural sands are generally found mixed with clay, which consists of decomposed rock.

Let me refer you to an article published in the Engineering News of Nov. 19, 1903, by Prof. C. E. Sherman of the Ohio State University, in which he reports laboratory tests up to one year of Portland cement, with different sands mixed with 0, 2, 4, 6, 8, 10 and 15 per cent (by weight) of clay and also loam. With very few exceptions, the adulterated sand tested superior to the natural sand. In most cases the 10 and 15 per cent mixtures tested quite uniformly and proved superior by, roughly, 25 per cent. With one exception the clay showed up slightly better than the loam mixtures.

His artificial clay-sand tests proved the same as our observations of natural sand containing clay. His artificial loam-sand tested superior to our artificial soil-loam. This latter difference is perhaps due to the difference in character of the material added. He describes the loam as "a common field soil obtained from the field north of the power house on the State University campus." Quite probably, in place of all decomposed material, it contained some clay, and possibly also some sand. This is the only way I can account for the superior comparative showing of the loam tests he made over our comparative soil tests. A small quantity of clay in the loam would change the results.

I will add here that there are two ways in which foreign material occurs in sand banks, one in the form of a fine material, uniformly distributed throughout it, and another in the form of layers or pockets which are entirely distinct from the sand. The cases mentioned, both natural and artificial, were the former. A specification which permits a definite amount of foreign material must, however, exclude all sand in which such material is not uniformly distributed throughout the sand, or, in other words, a part of it.

There are still other peculiar sands to be met with in nature. Your attention is especially called to one other natural sand which seemed to me most striking. It was excavated in Kansas City on the location of a freight house foundation, which in the flood of 1903 was several feet under water. From appearance and action it was hard to determine whether it contained a larger percentage of sand or clay. What grains it contained were so fine that they were scarcely perceptible to the touch. The quantity of clay seemed large because the trenches stood perfectly vertical under ordinary conditions. From the grit, I concluded it was sand, with a rather large percentage of clay. Tests were made of it and up to date we have the one year results. It proved to be a very fine sand which contained about 12 per cent of material in suspension, largely clay. The most striking peculiarity was its fineness. Everything passed through a No. 100 sieve and 93 per cent passed a No. 200. In fineness it was far superior to cement. I know of only one cement which is guaranteed 85 per cent in fineness on a No. 200 sieve. The usual specifications require about 75 per cent. Under an ordinary lens the grains of this sand were not visible. They appeared to be mostly smooth grains of silica.

The tests proved as interesting as the fineness. The early ones were low. The 7 and 28-day averaged about 53 per cent of the standard. The three months showed a good gain, while the six months and one year averaged about 77 per cent of the St. Paul standard, which is about the same showing made by the Ottawa and recommended as a standard by the American Society of Civil Engineers. The 12 per cent of foreign material, presumably clay, quite likely helped to improve the tests. I consider that this fine sand shows up remarkably well, in view of the fact that it is finer than the finest cement, and that 93 per cent passed a No. 200 sieve. It quite likely could be used in massive masonry, were it possible to allow the concrete to set for a year before subjecting it to severe strains.

I might call your attention to many other sands from along our line, which have been tested in our laboratory. The foregoing, however, illustrates the peculiarities most strikingly. Before concluding I wish to say a little more in regard

to the effect of washing, and also the effect of fineness on sands in general.

It will be remembered that the washed Jackson sand tested inferior to the unwashed, which contained 6 per cent of clay. The washing was done according to the laboratory practice (decantation). Immersed sand was shaken up in a water bottle and allowed to settle. The portion held in suspension was poured off. This process was continued until nothing was held in suspension. It will be seen that this method of washing differs widely from the regular practice used at the sand pits. It is my opinion that the Jackson sand would not have tested as well had it been subjected to regular washing in place of the laboratory method. The finer particles of sand would have been carried off with the clay. This would have left larger voids in the sand, and consequently it would not have tested as satisfactorily. (I will bring this out more clearly in the discussion of the fineness). Therefore, I believe that washing, on general principles, is not desirable unless conditions are unusual. At all events, the sand should be tested washed and unwashed, before going to the expense of fitting up a plant for washing. Unless the sand naturally contains an excess of fine particles or of foreign substances, I doubt if washing will better it.

Next in regard to the distribution of fine and coarse particles. A study of the table of fineness will show that the strength of a sand depends to a considerable extent on the proper distribution of the fine and coarse particles. The Ottawa sand, which was favorably recommended by the American Society of Civil Engineers, does not test well because its fineness is limited between a No. 20 and a No. 30 sieve. It is natural to expect that the absence of small grains leaves larger unfilled voids, and consequently the tests are not as strong. Tests of this sand only averaged about 80 per cent of the St. Paul standard. I attribute the good showing of our standard largely to the better distribution of the different-sized particles.

It is difficult to decide what distribution of grains would be most suitable. Please note, however, that the meshes of one sieve are about one-quarter the size of the next larger sieve, and that if there are 40 per cent of voids in the sand held between two sieves, there ought to be about the same amount of sand held between the next smaller-sized sieves, or enough to fill these voids, etc. On this assumption, I have figured out and tabulated the fineness of a sand that ought to give the best results. A sand might vary from this considerably and yet not alter results materially, because some other distribution of particles might result in as few voids, with only a slight increase in the surfaces to be coated with cement.

By comparing the excavated Kansas City sand with the fine "Track Elevation" sand, both of which are shown in the tabulation, it will be seen that the finer of the two, though it is much finer and hence has considerably more surface, tested better. This I think is partially accounted for by the undesirable distribution of the particles in the "Track Elevation" sand. Eighty-three per cent of the latter sand is held between a No. 50 and a No. 100 sieve, and the percentage of fine particles below this is not enough to fill the voids. See table. However, as stated in the earlier part of this paper, the fine flour-like sand has the advantage of 12 per cent clay, but this alone, in my judgment, does not account for the difference in showing. I also attribute the low tests of the Rockton sand shown in the tabulation to the same cause. There are not enough fine grains below the No. 50 sieve to fill the voids of larger particles. We have made a great many other tests, which tend to prove that this supposition is correct, but which I will not take time to go into.

To sum up the situation, it is quite evident that clay in limited quantities (say not to exceed 12 per cent) is beneficial if thoroughly distributed throughout the sand. Before using, however, it ought to be compared with an established standard.

Soil, on the other hand, is detrimental Sand containing it shows up irregularly. Such sand should prove satisfactory by tests before using.

Washed sand may be less desirable than unwashed. Washing removes the fine particles as well as the foreign material. The fine grains, if not in excess, are needed to fill the voids of the larger.

The only safe way to decide whether sand ought to be washed would be to test it under both conditions.

A fine sand may show up well if the grains are well graded. A coarse sand may show up poorly if there are too few fine particles to fill the voids. The best

graded sand is one in which the grains held on a uniform series of sieves are so arranged that the voids in one lot are filled, and not overfilled, by the grains in the next smaller size, and so on. This grading should begin with large grains in order to limit the surfaces exposed to cement, and still there grains must not be so large that the voids will not be filled with the smaller particles.

Briefly, then, the best mortar sand found in nature is one with sharp corners, rough surfaces, with grains neither coarse, medium nor fine, but with the proper mixture of all these sized particles which will result in the least voids. The sand also should not be washed but may contain up to 12 per cent of clay which will not injure, but will perhaps improve it.

The diagrams show in graphical form the results given in the tables and are not reproduced.

In accordance with the proposed amendment to the constitution, the various sections of the association met on adjournment of the morning session to select their vice presidents. Upon adoption of the amendments these vice presidents were reported as follows:

For the section on concrete blocks and cement products, B. L. Simpson, Kansas City, Mo.

For streets, sidewalks and floors, W W. Schouler, Newark, N. J.

For reinforced concrete, C. S. Hall Louisville, Ky.

For art and architecture, Charles E. Watson, Toronto, Can.

For cement manufacture and testing of cement and cement products, E. S. Boyer, New York City.

For machinery for cement users, W. W. Benson, Washington, D. C.

Standing committees of four additional members for each section are to be appointed by the president and the respective chairmen.

Columbus, O., Chicago, Ill., and Milwaukee, Wis., extended invitations for the next meeting of the convention and the final vote of the convention was for Milwaukee.

Many paid their admission fees at the close of the convention and became full members of the National Association of Cement Users. Others have the same opportunity, the registration card being considered a formal application for membership and the payment of the $5 fee for the first year to the secretary being all that is necessary to complete the transaction.

What They Say About the Convention.

Richard L. Humphrey, Philadelphia, Pa:

"The convention has been a decided success and marks the advent of a very important movement and a very necessary one. The rapid growth of the cement industry and its closely allied branches has caused the urgent need of an association of this character. It has been one of the most largely attended conventions of this order that I have had the pleasure of attending."

Eugene McDowell, Auburn Machine Co., Auburn, Ind:

"Very fine. It has been well worthy a man's patronage. I have received a great deal of information that I could not have obtained otherwise."

Sol. M. Wolf, Bellevue Stone Co., Bellevue, Ohio:

"Indianapolis is to be congratulated upon being the city in which, perhaps, the liveliest association that has been organized in the United States, has been founded. We came to see an association of two or three hundred members started, but the attendance has passed far beyond all our anticipatitons, which goes to show one of two things, either the cement users and manufacturers are badly in need of light, or that they are very much alive to their interests. I believe both to be the case."

J. W. Cooper, Minneapolis, Minn.:

"It has been a good show. The promoters have done nobly for a first convention."

A. C. Horn (Gross & Horn), New York City:

"Very fine. It is the best thing that could have happened to the industry. More has been done for us in our advertising line than could have been accomplished by thousands of letters sent throughout the country."

C. C. Huston, Blakeslee Concrete Block Company, Columbus, O.:

"We are entirely satisfied. The convention has been much larger than we expected that it would be. Future conventions will probably be three or four times the magnitude of this one. It has been a splendid starter."

D. D. Stringer, Stringer Machine Company, Jackson, Mich.:

"Very satisfactory."

M. Mulhauser, Standard Sand and Machine Company, Cleveland, O.:

"Splendid. Much more than I expected. It has been well worth our while to exhibit."

J. P. Stoltz, New York, representing Winget Machine Company:

"Away beyond my expectations. I expected to see about one hundred people, but have seen six times that many, and among them quite a number of eastern men. It has been well worth my time."

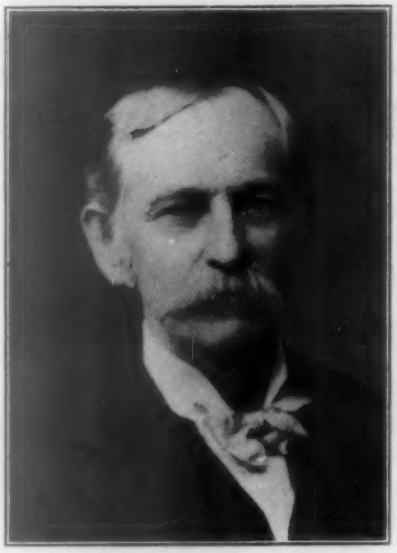
Mr. William Dickinson, Marquette Cement Company, Chicago, Ill.:

"I have been very much surprised at the attendance. I had no idea it would be so large. It has been an eye-opener to all interested in the industry."

L. P. Normandin, Cement Machinery Company, Jackson, Mich.:

"The convention has gone away beyond all expectations and has been a grand success. It has started with full grown wings."

Noyes F. Palmer, N. F. Palmer Mfg. Co., Brooklyn, N. Y.:



NOYES F. PALMER, BROOKLYN, N. Y.
Noyes F. Palmer Mfg. Co.

"All right. Could not have been better had it been held in New York. I am very much pleased with the way that the convention has been conducted. It has been very fair to all."

J. P. Sherer, National Building Block Co., Milwaukee, Wis.:

"An unqualified success and an agreeable surprise to all. This convention will result in inestimable good to all concerned."

WM. DICKINSON, CHICAGO, ILL.
Marquette Portland Cement Co.

Chas. L. Johnson, Castalia Portland Cement Co., Pitsburg, Pa.:

"Beyond anything that I expected by three or four hundred per cent. I have never seen such interest in a convention, which has been the most enthusiastic that I have ever attended."

S. L. Kelley, Ideal Concrete Machinery Co., Auburn, Ind.:

"I have been thoroughly impressed with the enthusiasm displayed. The interest has been intense. The prospective block maker has received great insight into what the different companies are doing. The industry has been vastly promoted."

W. W. White, Winget Machine Company, Columbus, O.:

"A complete success. For cement machine men it has been five or six times as valuable as the World's Fair from a practical standpoint."

S. J. Vail, Whitehall Portland Cement Company, Philadelphia, Pa.:

"A surprisingly large attendance. I have been very much pleased."

C. A. Chamberlain, Cement Machinery Company, Jackson, Mich.:

"Several outside influences are creeping in which may make trouble, but I believe a successful termination will be accomplished."

T. O. Eichelberger, Cottom Artificial Stone Co., Dayton, Ohio:

"Great success."

T. O. EICHELBERGER, DAYTON, O.
Cottom Artificial Stone and Mfg. Co.

M. M. Moralee, The Kakiat Co., Suffern, N. Y.:

"We came to gather information and to verify what we already knew about this business. We feel more than fully repaid."

R. O. Miracle, Miracle Pressed Stone Co., Minneapolis, Minn.:

"Far in excess of the attendance that I expected."

J. M. Campbell, American Concrete Mixer Co.:

"Howling success. I can say without reservation that I have never seen such an enthusiastic meeting."

C. P. Widdicombe, Chase Foundry and Manufacturing Co., Columbus, Ohio.

"I have been greatly surprised at the amount of interest shown in all branches of the industry. I hope that all will be at the convention next year."

E. W. Seamans, Grand Rapids, Mich.:

"This convention will improve ideas. After enough have been held great good will be reaped from them."

E. S. Larned, American Cement Company, Philadelphia, Pa.:

"The convention has been an agreeable surprise to me. It suggests wider fields and it has brought together all those that are interested in the country, enabling an interchange of ideas that are bound to be beneficial to all."

L. Pettyjohn, Pettyjohn Bros., Terre Haute, Ind.:

"This convention is the best thing that could have been brought about for the benefit of concrete people. From our point of view we are very much pleased. It has given every man an opportunity to see the different machines and has had a strong tendency to promote good fellowship among the different men in the business."

E. B. Kelley, Smith Mixer Company, Chicago, Ill.:

"I am very much gratified over the election of officers. I am also very much surprised at the number in attendance and at the enthusiasm shown."

W. M. SCOTT, COLUMBUS, O.
Hayden Automatic Block Machine Co.

W. M. Scott, Hayden Automatic Machine Company, Columbus, O.:

"Very successful. No one could ask for more. I have attended conventions over the entire country, but this is superior to them all."

W. H. McDowell, Auburn Concrete Block Machine Company, Auburn, Ind.:

"Beyond a doubt the convention has certainly been a success, and of much greater magnitude than I anticipated before coming here."

H. E. Goodwin, Goodwin Concrete Block Machine Company, Indianapolis, Ind.:

"It has been a great gathering. I am very well pleased. Best thing that has ever happened to the cement user and manufacturer. It has proved a great advertising medium."

W. O. William, Century Cement Machine Company, Rochester, N. Y.:

"A huge success. It has surpassed anything that I thought could be assembled. Shows the intense interest that is being taken in this field of business."

A. Crandall, Century Cement Machine Company, Rochester, N. Y.:

"It has been a much greater success than any of the cement workers anticipated, and no doubt great good will come from it to all interested in cement work."

W. E. Ellenberger, Cleveland Car Co., Cleveland, Ohio:

"A howling success. The best I have ever attended."

H. Abrams, Universal Concrete Machine Co., Norfolk, Va.:

H. E. GOODWIN, INDIANAPOLIS, IND.
Goodwin Cement Block Machine.

"Everyone's expectations have been more than fully met. The convention has put a thought that will develop the trade and has put the public into a frame of mind that will prove favorable to cement construction."

J. A. Mitchell, Goshen, Ind.:

"A success in view of it being the first. I think it will develop into a great association and be of much benefit to cement users all over the country."

Ernest McCullough, C. E., Chicago, Ill.:

"A great success. The organization supplies a real need and much good will result. It is organized on conservative

JOHN N. RAUBER, ROCHESTER, N. Y.
Century Cement Machine Co.

lines in a disinterested, honest, modern spirit, with a proper representation of all interests."

Wilmer H. Gemmer, Williamsport, Ind..

"Pleased, except that it runs too much to the cement block, especially in the advertising section. This should be general and the association permanent."

Geo. H. Carlon, Oskaloosa, Ia.:

"Very much pleased. One of the best moves that could be taken to advance the cement industries of the country."

Merrill Watson, New York City, was overheard to say that it was a success, a surprise in attendance and interest and that with proper discrimination the association can be built up to one of the most important of its kind in this country.

Alexander C. Birnie, Springfield, Mass.:

"An astonishing and gratifying evidence of the public interest and confidence in cement and its manifold uses as a structural material."

Dr. Chas. F. McKenna, New York City:

"The most attractive thing about the convention is the absorbing desire for information. It may be well to remember that the standards will have to be set; first, for binding material; secondly, for aggregate; thirdly, for coloring or ornamental agent; and, lastly, for such qualities as strength, etc., of finished structures."

DR. CHAS. F. McKENNA, NEW YORK CITY.

C. M. Menefee, Ft. Wayne, Ind.:

"Undoubtedly a great success. The bringing together of so many people interested in cement and concrete work will advance the interests of all concerned immensely."

S. J. Vail, Whitehall Portland Cement Co., Chicago, Ill.:

"Very agreeably surprised at the extremely large attendance and consider that the cement users should feel themselves under very deep obligations to the gentlemen promoting the association."

A. Monsted, Milwaukee, Wis.:

"A move in the right direction. My only regret that it was not started several years ago."

Will J. Scoutt, Chicago, Ill.:

"An unqualified success."

Arthur N. Pierson, Miracle Pressed Stone Co., New York City.

"I am most favorably impressed. It cannot but stimulate the cement industry."

Adam Saal, Pekin, Ill.:

"A grand success. A school of instruction for the skilled and unskilled workman. Should be at least double next year."

Harry L. Mooar, Underwood Macnine Co., Columbus, O.:

"A long step toward the permanent advancement of the cement industry."

E. B. McDowell, Winget Concrete Machine Co., Columbus, O.:

"The unexpected large attendance and the great interest and enthusiasm bespeak a bright and useful future."

W. H. Caskey, Cleveland Car Co., West Park, O.:

"An unqualified success in every way. A necessary organization, started under favorable conditions."

L. F. Perdue, Terre Haute, Ind.:

"The projectors of the convention deserve great credit. The meeting will be productive of great good."

Chas. S. Watson, Mgr. Roman Stone Co., Toronto, Can.:

"An unusually successful beginning of what bids fair to be one of the largest and best associations of its kind in the country. Its foundation has been laid upon exceptionally broad lines."

S. J. VAIL, CHICAGO, ILL.
Whitehall Portland Cement Co.

Oliver Test, Mgr. Richmond Concrete Construction Co., Richmond, Ind.:

"A success. The large attendance and interest manifested and exhibits of machines and materials are very creditable."

C. P. Englehart, Peerless Portland Cement Co., Union City, Mich.:

"A great success. It certainly has brought together every business that was interested in the cement line. Long may the association stand."

Geo. B. Kirwan, Hunkins-Willis Lime and Cement Co., St. Louis, Mo.:

"I believe that the convention will result in a deeper and closer study of the nature, properties and best methods of usage of cement."

J. J. Abbott, Cement Products Co., Denver, Colo..

"A notable and gratifying success. In point of numbers and of sustained interest nothing better could have been hoped for by any one."

A. D. Mackay, Chicago, Ill.:

"The fact that almost 600 representative men from all over the United States should take the time from their business to attend such a convention shows conclusively that cement and concrete are the live issues of the day."

J. W. Sanderson, Cement Machinery Mfg. Co., Burlington, Wis.:

"A grand success and a great educator."

R. H. BOWEN, KEOKUK, IOWA.
Western Brick Co.

R. H. Bowen, Western Brick Co., Keokuk, Ia.:

"One of the greatest conventions it was ever my pleasure to attend."

F. C. Bogk, Ricketson Mineral Paint Works, Milwaukee, Wis.:

"More people than we looked for. A success in every way."

J. R. Berthelet, Milwaukee, Wis.:

"The originators of the idea certainly deserve great credit for the association formed and the thanks of every member or user of cement."

J. P. SHERER, MILWAUKEE, WIS.
Pres. Whitehall & Rade maker Supply Co.

J. A. Jackson, Clarksburg, W .Va.:

"The association, properly conducted, will do the cement users a great deal of good."

Dunn Bros, Lithogen Stone Co., Muncie, Ind.:

"A success. We have obtained several points on the uses of cement of value in our business."

Chas. Mankedick, Sullivan, Ind..

"A grand success of inestimable advantage to all who attended and to the public in general. It is the general opinion that it is the greatest convention ever held."

J. A. Fairleigh, Western Cement Co., Louisville, Ky.:

"I am highly pleased with the organization. I anticipate a useful and successful career for the association."

J. W. Shone, Century Cement Machine Co., Rochester, N. Y.:

"A great success. Much larger than we anticipated. It ought to last five days instead of three."

Geo. L. Stanley, Ashtabula, O.:

"Well satisfied. I confidently look for it to be the strongest organization in the United States that the building trades have attempted to foster and encourage."

Edward D. Boyer, Cement Expert, Atlas Portland Cement Co., New York City:

"I congratulate you upon the wonder-

W. W. SCHOULER, NEWARK, N. J.

ful success of the meeting. The attendance must astonish even the promoters of the meeting, and the interest displayed is a marvel, even to us who know of the wonderful advance Portland cement has made as a building material in the last decade."

Personal Notes About the Convention.

Mr. J. P. Sherer of Milwaukee, Wis., was one of the members prominent in all good work for the convention. Mr. Sherer is the vice-president and manager of the National Building Block Company, which is making blocks and machines with which to make blocks. After he came to the convention he received the added honor of election to the position of president of the Whitnall & Rademaker Supply Company, one of the largest dealers in building supplies in the Northwest, with which company he has been connected in responsible capacities for a number of years. The members of the association had their appetites whetted for the good stories as well as the authoritative information which they will expect next year when the convention meets in Mr. Sherer's home city.

Mr. W. W. Schouler, who was selected as the vice-president for the section on streets, sidewalks and floors, has been interested in cement work in Newark, N. J., for seventeen years, longer than any one else in that city of 300,000 population. He was president of the Builders' and Traders' Exchange for two years and is now the president and treasurer of the Cement Concrete Association and delegate to the Associated Building Contractors, both county and State organizations. Mr. Schouler does sidewalk and street paving and is an expert on stable construction, owning some valuable patents on stall floors, door guides, sanitary traps and other appliances. He also does mass concrete work. He is the pioneer in the manufacture of cement blocks in Newark and this part of his business is still in its infancy. The inspiration and enthusiasm derived from the convention will, he thinks, aid him much in developing this line.

One of the genial convention visitors from Milwaukee was Mr. R. J. Schwab of the R. J. Schwab & Sons Co., pattern-makers, founders and machinists of that city. They were pioneers in the manufacture of cement building block machines, having made the first commer-

R. J. SCHWAB, MILWAUKEE, WIS.

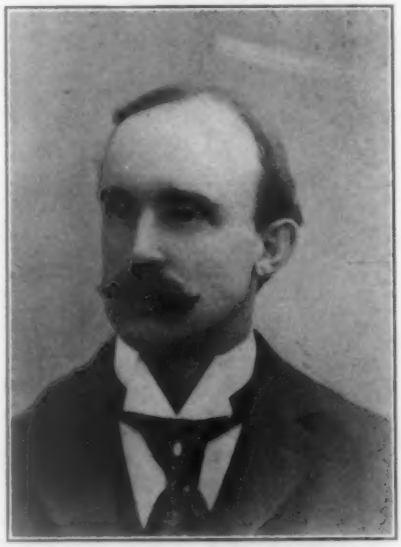
cially practical machine put on the market for this purpose four years ago. They have added to and improved their facilities for this work, until today they are among the foremost makers of such machines. The careful and exact workmanship and finished appearance of the machine and molds at the convention

made by the R. J. Schwab & Sons Co. compared favorably with any on exhibition. The machines made in their foundry turn out square, true and dependable blocks. The mechanical ability of Mr. R. J. Schwab and his large experience are the reasons for the high quality of work turned out.

Mr. A. R. Edmunds of the Standard Cement Block and Construction Co., Indianapolis, was the efficient chairman of the committee on exhibits and much of the satisfaction expressed by exhibitors with their treatment at the convention is due to his unremitting efforts. He was ably assisted by Mr. W. A. Bruce of Indianapolis, who is a special agent for the Seamans machines.

The Registration List.

The following is the list of those registering, corrected to the close of the convention. Additional corrections are requested by the secretary that the list in the published volume of proceedings may be accurate:



A. R. EDMUNDS, INDIANAPOLIS, IND.
Standard Cement Block Construction Co.

1. Chas. Carroll Brown, Municipal Engineering, 408 Commercial Club Bldg., Indianapolis.
2. S. W. Peet, Municipal Engineering, Indianapolis.
   Standard Cement Block and Construction Co., 325 W. 26th-st., Indianapolis.
3. A. R. Edmunds, Indianapolis.
4. W. F. Barrows, Indianapolis.
5. F. T. Randall, Municipal Engineering, Indianapolis.
6. H. E. Goodwin, 208 Blake-st., Indianapolis.
   P. B. Miles Mfg. Co., Jackson, Mich.
7. A. J. Ralph, Indianapolis.
8. J. H. Wiest, Indianapolis.
9. W. A. Bruce, Indianapolis.
10. Wm. Fortune, Municipal Engineering, Indianapolis.
11. Russell Fortune, Municipal Engineering, Indianapolis.
12. Standard Cement Block and Construction Co., 325 W. 26th-st., Indianapolis, H. Edmunds.
    Cement Mach. Co., Jackson, Mich.
31. S. L. Wiltse, Jackson, Mich.
32. John P. Given, Circleville, O.
33. C. A. Chamberlain, Jackson, Mich.
34. L. D. McClaflin, Jackson, Mich.
35. L. P. Normandin, Jackson, Mich.
36. M. J. Furnas, Jackson, Mich.
37. Wm. Phillips, Columbus, O.
38. Chas. Kuhlman, E. St. Louis, Ill.
39. H. Tonies, 520 N. 24th-st., E. St. Louis, Ill.
    Century Cement Machine Co., Rochester N. Y.
40. J. W. Shone, Rochester, N. Y.
41. W. O. Williams, Rochester, N. Y.
42. John N. Rauber, Rochester, N. Y.
43. Ely Roberts, Rochester, N. Y.
44. A. T. Bradley, Rochester, N. Y.
45. A. Crandall, Rochester, N. Y.
    Pettyjohn Bros., Terre Haute, Ind.
50. C. W. Flagg, Brazil, Ind.
51. J. M. Cutshall, Brazil, Ind.
52. L. P. Dunn, Terre Haute, Ind.
53. L. Pettyjohn, Terre Haute, Ind.
    Municipal Eng. and Contracting Co., Chicago, Ill.
55. Ernest McCullough, C. E., Chicago, Ill.
56. C. H. Bathrick, Chicago, Ill.
57. New Enterprise Machinery Co., 92 La Salle-st., Chicago, D. D. Riddle.
58. Castalia Port. Cement Co., Chas. L. Johnson, 1029 Columbus-ave., Sandusky, O.
59. J. W. Haas, Charlotte, N. C.
    H. S. Palmer Co., Washington, D. C.
60. W. W. Benson, Washington, D. C.
61. H. S. Palmer, Washington, D. C.
62. Geo. Vogel, Washington, D. C.
63. Henry Wood, Washington, D. C.
64. J. F. Messick, Indianapolis.
65. H. Staples, Indianapolis.
66. C. F. Childers, Indianapolis.
    National Building Block Co., Milwaukee, Wis.
70. H. F. Behrle, Milwaukee, Wis.
71. J. P. Sherer, Milwaukee, Wis.
72. Otto Gehrlar, Milwaukee, Wis.
    Universal Concrete Machinery Co., Norfolk, Va.
75. A. S. J. Gammon, Norfolk, Va.
76. H. Abrams, Norfolk, Va.
    U. S. Cement, Shingle and Machinery Co., Saginaw, Mich.
77. Fred J. Lee, Saginaw, Mich.
78. Geo. C. Zwerk, Saginaw, Mich.

79. American Concrete Construction Co., Cincinnati, O., James F. Abbey.
Gross & Horn, 249 Front-st., New York City.
80. A. C. Horn, New York.
81. August Gross, New York.
82. Hunkins-Willis Lime and Cement Co., St. Louis, Mo., G. B. Kirwan.
Blakeslee Con. Block and Mach. Co., Columbus, O.

H. F. BEHRLE, MILWAUKEE, WIS.
National Concrete Block Co.

83. C. C. Shepherd, Columbus, O.
84. C. C. Huston, Columbus, O.
Ideal Concrete Machinery Co., Auburn, Ind.
85. M. Wetzstein, Auburn, Ind.
86. F. J. Fitzsimmons, Auburn, Ind.
87. S. L. Kelley, Auburn, Ind.
88. F. A. Borst, Auburn, Ind.
89. Fritz Arnold, Auburn, Ind.
Cottom Artificial Stone and Manufacturing Co., Dayton, O.
91. T. O. Eichelberger, Dayton, O.
92. J. W. Popenoe, Dayton, O.
93. Peter Helfrich, Spencerport, N. Y.
94. E. D. Palmer, Yankton, S. D.
Block Bridge and Culvert Co., 108 N. Delaware-st., Indianapolis.
95. H. F. Hackedorn, Indianapolis.
96. W. H. Benton, Indianapolis.
97. Everett Wagner, Indianapolis.
Noyes F. Palmer Mfg. Co., Brooklyn, N. Y., 150 Snediker-ave.
98. Noyes F. Palmer, Brooklyn, N. Y.
99. Albert W. Palmer, Brooklyn, N. Y.
Atlas Portland Cement Co., New York City, 30 Broad-st.
100. E. D. Boyer, New York City.
101. S. F. Berger, New York City.
102. Paul A. Jandernal, New York City.
103. Monticello Lumber and Coal Co., Monticello, Ind., C. D. Meeker.
104. M. S. Daniels, New York City, 24 State-st.
105. The Kakiat Co., Suffern, N. Y., M. M. Moralee.
107. P. B. Miles Mfg. Co., Jackson, Mich., P. B. Miles.
109. J. A. Mitchell, Goshen, Ind.
110. Frost & Son, Jerseyville, Ill., F. M. Frost.
111. J. Ray Williams, Carrolton, Ill.
H. E. Goodwin & Co., 208 Blake-st., Indianapolis.
112. E. Ingles, Indianapolis.
113. J. A. Ball, Indianapolis.
114. Lyde Fay, Indianapolis.
115. J. B. Long, Indianapolis.
116. J. Overman, Indianapolis.
117. Wm. Goodwin, Indianapolis.
118. A. Fitzgerald, Indianapolis.
119. Automatic Building Block Machine Co., Jackson, Mich., A. M. Haight.
120. Block Bridge and Culvert Co., Indianapolis, S. J. Rice.
121. American Building Block Co., Indianapolis, J. R. O'Neil.
122. Saal & Brooking, Pekin, Ill., Adam Saal.
123. Chas. F. McKenna, 221 Pearl-st., New York City.
124. Eureka Fence Post Co., Indianapolis, Clayton T. La Bau.

G. B. KERWAN, ST. LOUIS, MO.
Hunkins-Willis Lime and Cement Co.

125. Standard Paving Co., Newark, N. J., W. W. Schouler.
126. New Jersey Cement Stone Co., East Orange, N. J., J. W. Pearson.
Dever Cement Tank and Silo Co., Cassopolis, Mich.

127. Geo. M. Rivers, Cassopolis, Mich.
128. O. A. Dever, Cassopolis, Mich.
129. Adolph Adams, Kendallville, Ind.
130. James P. Hall, Jersey City, N. J.
131. Merrill Watson, New York City.
132. R. O. Myers, South Bend, Ind.
133. Indiana Cement Block and Post Co., W. E. James, Indianapolis.
134. Concrete Construction Co., Steubenville, O., Chas. D. Floto.
135. Georgia Hydraulic Stone Co., Dublin, Ga., H. C. Quinn.
136. Ricketson Mineral Paint Co., Milwaukee, Wis., Edward Bogk.
137. Geo. F. Meyer, Indianapolis.
138. Portland Cement Works, Ashtabula, O., Geo. L. Stanley.
140. A. Ferguson, Indianapolis.
141. J. W. Cooper, Minneapolis, Minn.
142. Whitehall Portland Cement Co., Philadelphia, Pa., S. J. Vail., Chicago, Ill.
143. E. W. Seamans, Grand Rapids, Mich.
144. Whitehall Portland Cement Co., Philadelphia, Pa., H. F. Rauch.
145. Hayden Automatic Block Machine Co., Columbus, O., W. M. Scott.
146. The Chase Foundry and Mfg. Co., Columbus, O., C. P. Widdicombe.
148. Jas. E. Southard, Michigan City, Ind
149. A. C. Heitschmidt, Michigan City, Ind.
Winget Concrete Machine Co., Columbus, O.
150. E. B. McDowell, Columbus, O.
151. J. P. Stolz, New York City.
152. J. H. Twitchell, Columbus, O.
153. John A. McDowell, Columbus, O.
154. W. L. Smith, Columbus, O.
155. S. M. Coe, Columbus, O.
156. J. H. Hains, Columbus, O.
157. J. F. Angell, Columbus, O.
160. Joseph W. Vance, Springfield, Ill.
161. Pickaway Cement Block Co., Circleville, O., Geo. T. Row.
163. C. A. Monks, Louisville, Ky.
164. J. A. McNiern, Canton, O.
165. Ohio Stone and Paving Co., Youngstown, O., L. D. Gibson.
166. Wm. W. White, St. Louis, Mo.
167. H. N. Jones, Houston, Tex.
168. F. R. Goodrich, Traverse City, Mich
169. C. W. Diener, Burlington, Wis.
170. W. F. Roney, Grand Island, Neb.
171. S. G. Webb, Columbus, O.
172. B. H. Graves, Lostant, Ill.
173. Western Cement Co., Louisville, Ky., J. A. Fairleigh.
174. The Bonnet Co., L. C. Bonnot, Canton, O.
175. J. D. Wood, Wheeling, W. Va.
176. Garden City Sand Co., Chicago, Ill., S. W. Curtiss.
177. C. L. Huyck, Chicago, Ill.
178. H. E. Haskins, Lake Geneva, Wis.
179. F. D. Shewell, Sebring, O.
180. E. B. Hoy, Chicago, Ill.
181. Walnut Cement Stone Co., Walnut, Ia., J. B. Johannsen.
182. E. C. Mack, Alton, Ill.
183. S. V. Peppel, Louisville, Ky.
184. John Blake, Wolcott, Ind.
185. Fellows & Browning, Scranton, Pa., J. H. Fellows.
186. B. L. Simpson, Kansas City, Mo.
187. P. H. Phillips, Burlington, Ia.
189. W. H. Nice, Barberton, O.
190. Fred Stocker, Highland, Ill.
191. R. M. Secord, Nashville, Tenn.
192. John Jameson, New York City.
193. Geo. J. Schwarz, Milwaukee, Wis.
194. J. W. Sanderson, Burlington, Iowa.
196. M. C. Robinson, Ashtabula, O.
199. T. L. Smith, Milwaukee, Wis.
200. Richard L. Humphrey, Philadelphia, Pa.
201. F. Ferren, Des Moines, Ia.
202. S. D. Austin, Milwaukee, Wis.
203. Philip Dieffenacher, Massillon, O.
204. W. T. Berthelet, Milwaukee, Wis., Berthelet Const. Co.
205. J. R. Berthelet, Milwaukee, Wis., Berthelet Const. Co.
206. Chas. Lawrence, Indianapolis.
207. R. J. Schwab, Milwaukee, Wis.
208. C. F. Scott, Princeton, Ill.
209. B. F. Bell, Newcastle, Ind.
210. Gus Garrett, Cambridge City, Ind.
211. Geo. H. Carlon, Oskaloosa, Ia.
212. Harry Hurst, Louisville, Ky.
213. John Driscoll, Appleton, Wis.
214. C. H. Carlon, Oskaloosa, Ia.
Cleveland Car Co., Cleveland, O.
215. W. H. Caskey, West Park, O.
216. W. E. Ellenberger, Cleveland, O.
Bellevue Stone Co., Bellevue, O.
217. Sol M. Wolf, Bellevue, O.
218. T. E. Wyant, Bellevue, O.
219. Hotchkiss Concrete Stone Co., E. S. Hotchkiss, Chicago, Ill.
220. Cement Products Co., Denver, Colo., J. J. Abbott.
221. A. C. Birnie, Springfield, Mass.
222. Cement and Engineering News, Chicago, Ill., Wm. Seafert.
223. Peerless Portland Cement Co., Union City, Mich., C. P. Englehart.
Newaygo Port. Cement Co., Grand Rapids, Mich.
224. J. F. Lockley, Grand Rapids, Mich.
225. R. S. Conner, Grand Rapids, Mich.
226. Perry Moore, Bloomingdale, Ind.
227. J. A. Doe, Omaha, Neb.
228. E. J. Lord, Honolulu, H. I.
229. Fred P. Horschel, Ironton, O.
230. Will Filigrove, Ironton, O.
231. A. Monsted, Milwaukee, Wis.
232. Wm. S. Winsor, St. Louis, Mo.
233. R. T. Smith, St. Louis, Mo.
234. St. Louis Portland Cement Co., St. Louis, A. Baumberger.
235. J. M. Campbell, Columbus, O.
236. W. W. Horn, Memphis, Tenn.
237. G. F. Roess, Oil City, Pa.
238. Wm. R. Davis, Youngstown, O.
239. Veeder Heasley, Youngstown, O.
240. Chas. Killen, Columbus Grove, O.
241. J. M. Osmun, Champaign, Ill.
242. W. T. Smith, Jackson, Mich.
243. H. A. Grover, Jackson, Mich.
244. Thos. D. Robbins, Indianapolis.
245. G. McDonald, St. Louis, Mo.
246. Rev. J. C. Burkhardt, Connersville, Ind.

247. H. A. Smock, Martinsville, Ind.
248. Chas. Moorman, Rushville, Ind.
249. E. B. Moorman, Rushville, Ind.
250. Wolverine Portland Cement Co., W. E. Cabeau, Chicago, Ill.
251. E. Osgood, Chicago, Ill.
252. A. Potts, C. & A. Potts & Co., Indianapolis.
253. J. D. Noble, Indianapolis.
254. Harry A. Axtell, Bloomington, Ind.
255. W. I. Fee, Bloomington, Ind.
256. D. N. Harper, Detroit, Mich.
257. J. E. Sweet, Martinsville, Ind.
258. S. J. Mandeville, Martinsville, Ind.
259. B. T. Young, Nashville, Tenn.
260. C. F. Born, Danville, Ind. Indiana Gravel Co., Indianapolis.
261. J. A. Shearer, Indianapolis.
262. Harold Burdge, Indianapolis.
263. B. F. Stanley, Decatur, Ill.
264. I. L. Shaw, Gibson, Ill.
265. Walter C. Holmes, Portland, Ind., Holmes Bros.
266. C. Pickett, Marshall, Ind.
267. C. F. Asbury, Marshall, Ind.
268. A. D. Mackay & Co., Chicago, Ill., A. D. Mackay.
269. J. P. Grubbs, Urbana, Ill.
270. R. H. Bowen, Keokuk, Ia.
271. H. H. Symmes Co., Indianapolis, H. H. Symmes.
272. Moore-Mansfield Construction Co., Indianapolis, De Witt V. Moore.
273. E. H. Oversmith, Jackson, Mich.
274. W. M. Birch, Muncie, Ind.
275. Waterville Cement Fence and Stone Co., Toledo, O., F. K. Hogue.
276. Daniel B. Luten, Indianapolis.
277. E. J. Westbrook, Paxton, Ill.
278. James Farley, Homer, Ill.
279. E. Power, Frankfort, Ky.
280. J. O. Sloan, Indianapolis.
281. W. F. Pyle, Geneva, Ind.
282. Chas. K. Baird, Hamilton, O.
283. F. A. Marine, Mooresville, Ind.
285. Peter Levandouski, Lafayette, Ind.
286. John Levandouski, Lafayette, Ind.
287. N. Underwood, Durham, N. C.
288. Simon L. Dunlap, Indianapolis.
289. Fred K. Irwine, Louisville, Ky.
290. A. C. Brown, Indianapolis.
291. John F. Gray, Portland, Ind.
292. Chas. Reed, Portland, Ind.
293. E. E. Lyst, Anderson, Ind.
294. C. H. Daniels, Anderson, Ind.
295. Wm. R. Grove, Lebanon, Ind. Indianapolis Cement Products Co., Indianapolis.
296. Fred W. Day, Indianapolis.
297. Walter L. Day, Indianapolis.
298. W. H. Beazel, Indianapolis.
299. E. O. Newell, Indianapolis.
300. B. F. Drischel, Richmond, Ind.
301. Edwin Hicks, North Vernon, Ind., E. Hicks & Co.
302. Karl L. Hanson, Connersville, Ind.
303. Roy Williams, Connersville, Ind.
304. J. C. Everroad, Columbus, Ind.
305. John J. Grandville, Saginaw, Mich.
306. C. L. Post, Terre Haute, Ind.
307. J. W. Wood, Parkersburg, W. Va.
308. E. B. Kelly, New York City.
309. J. R. Dunlap, Columbus, Ind.
310. J. W. Van Arsdall, Edinburg, Ind.
311. John Bernard, Burlington, Ia.
312. E. F. Facemire, Edinburg, Ind.
313. C. W. Minick, Knightstown, Ind.
314. I. A. Clarkson, Clarksburg, W. Va.
315. C. M. Reynolds, Auburn, Ind.
316. Geo. Benedict, Nashville, Tenn.
317. E. W. Seamans Co., H. H. Carter, Indianapolis.
318. E. A. Henby, Greenfield, Ind.
319. J. W. Shock, Huntington, Ind.
320. F. B. Fulton, Huntington, Ind.
321. Chas. Mayer, Cincinnati, O.
322. Robt. Russell, Washington, Ind.
323. E. Allen, Washington, Ind.
324. G. T. Fulton, Hartford City, Ind.
325. R. B. Fulton, Hartford City, Ind.
326. M. E. White, 520 Ashland-ave., Indianapolis.
327. H. J. Prier, Indianapolis.
328. J. M. King, Ashland, Ky.
329. J. A. Patterson, Gassaway, W. Va.
331. C. M. Menefee, Ft. Wayne, Ind.
332. O. F. Menefee, Ft. Wayne, Ind.
333. Standard Sand and Machine Co., Cleveland, O., A. L. Broughton.
334. F. H. Eno, Columbus, O.
335. Oliver Test, Richmond, Ind.
336. Geo. T. Row, Columbus, O.
337. A. Shoemaker, Indianapolis.
338. W. H. Fisher, Mt. Gilead, O.
339. G. M. Albertson, Orleans, Ind.
340. J. W. Layman, Indianapolis.
341. J. A. Pike, Bloomington, Ind.
342. Wm. O. Line, Liberty, Ind.
343. Thos. H. Gibbons, College Corner, O.
344. J. T. Walker & Son, E. R. Walker, Indianapolis.
345. Chas. Harriman, New York City.
346. D. H. Fatout, Indianapolis.
348. H. Dakin & Co., Elgin, Ill., H. Dakin.
349. F. M. Price, Newcastle, Ind.
350. D. R. Wampler & Son., O. F. Wampler, Dayton, O.
351. D. R. Wampler & Son., D. R. Wampler, Dayton, O.
352. H. H. Pierce, Chicago, Ill.
353. J. W. Landrum, Terre Haute, Ind., Terre Haute Coal and Lime Co.
354. A. E. Bradshaw, Indianapolis Mortar and Fuel Co., Indianapolis.
355. J. W. Jackson, Practical Cement Block Co., Indianapolis.
356. C. A. Foster, Elkhart, Ind.
357. J. A. Hardin, Anderson, Ind.
358. J. T. Richards, National Bridge Co., Indianapolis.
359. T. A. Randall, Indianapolis.
360. Frank L. Wolfe, Two Rivers, Wis.
361. R. Schulz, St. Louis, Mo.
362. Joe Ubbink, Pt. Washington, Wis.
363. Buser Concrete Construction Co., Mt. Morris, Ill.
364. John N. Le Hew, Warsaw, Ind.
365. Frank Terry, Findlay, O.
366. R. R. Fish, Lagrange, Ind.
367. H. D. Bickel, Bluffton, Ind.
368. J. L. H. Barr, Batavia, O.
369. John Wood, Owenton, Ky.
370. F. G. Ader, Newport, Ky.
371. G. H. Stevens, Newport, Ky.

372. Ideal Cement Post Mfg. Co., Elkhart, Ind., C. L. Catherman.
373. D. H. Steele, Ilion, N. Y.
374. Geo. F. Fisher, N. Tonawanda, N. Y.
375. W. A. Baden, Petersburg, Ind.
376. D. Frank Magee, Lancaster, Pa.
377. W. D. Eichenlaub, Erie, Pa.
378. F. J. Eichenlaub, Erie, Pa.
379. R. A. S. Bloomer, Newark, N. Y.
380. L. F. Perdue, Terre Haute, Ind.
Lehigh Portland Cement Co.
381. E. E. Fillion, Mitchell, Ind.
382 William L. Whitaker, Mitchell, Ind.
383. W. O. McKinney, Piper City, Ill.
384. J. H. McCreary, Galion, O.
386. Buffalo Litholite Co, Buffalo, N. Y., Harry Evers.
387. The Roman Stone Co., Toronto, Can.. Chas. D. Watson.
American Hydraulic Stone Co., Denver Colo.
388. W. J. Scoutt, Chicago, Ill.
389. H. D. Watson, Chicago, Ill.
390. F. H. Gill, Chicago, Ill.
391. G. Cutter, Chicago, Ill.
392. E. A. Parsons, Chicago, Ill.
393. F. E. Davenport, Chicago, Ill.
394. R. C. Burmood, Chicago, Ill.
395. R. B. Watrous, Milwaukee, Wis.
396. Jonathan Stewart, Portland, Ind.
397. Knightstown Concrete Co., Knightstown, Ind., Harry Watts.
398. Chas. Ohmart, Dayton, O.
399. H. B. Stephens, Eaton, O.
400. Harley Worden, Dayton, O.
Stringer Mach. Co., Jackson, Mich.
401. W. H. French, Jackson, Mich.
402. D. D. Stringer, Jackson, Mich.
403. R. Sumption, Ridgeville, Ind.
404. J. M. Pease, Geneva, Ind.
405. John C. Pierce, Rockville, Ind.
406. J. J. Gayer, Spencerville, O.
407. Chas. A. Bell, Pittsboro, Ind.
Miracle Pressed Stone Co., Minneapolis, Minn.
408. O. U. Miracle, Minneapolis, Minn.
409. A. L. Goetzmann, Chicago, Ill.
410. J. W. Pierson, New York City.
411. A. N. Pierson, New York City.
412. A. W. Hogue, Chicago, Ill.
413. A. R. Knight, Chicago, Ill.
414. J. O. Parry, Chicago, Ill.
415. E. B. Swift, Indianapolis.
416. A. F. Bowers, Chicago, Ill.
417. Capt. L. Harris, Sergent, Neb.
418. R. O. Miracle, Minneapolis, Minn.
419. W. Mont Gibbs, Milltown, Ind.
420. W. H. Gemmer, Williamsport, Ind.
421. Wm. P. Carmichael, Williamsport, Ind.
422. Geo. P. Schwaab, Chicago, Ill.
423. S. P. Selby, Detroit, Mich.
424. F. E. Paulson, Cleveland, O.
425. C. D. Smith, Chicago, Ill.
426. W. B. Myers, Chicago, Ill.
427. Fred W. Hagloch, Cleveland, O.
428. J. S. Dudley, Newark, O.
429. L. D. Wheeler, Cleveland, O.
430. C. S. Hall, Louisville, Ky.
431. John McNamara, Newark, O.
432. W. W. Sawyer, Rockford, Ill.
433. H. F. Abbott, Jackson, Mich.
434. Geo. Brady, Jackson, Mich.
435. Jas. Geddes, Jackson, Mich.
436. John Snelzer, Ft. Wayne, Ind.
437. Standard Sand and Mach. Co., Cleveland O., M. H. Muelhauser.
438. Municipal Journal and Engineer, New York City, J. M. Schloenback, Chicago, Ill.
439. Albert T. Gridley, Aurora, Ind.
440. L. V. Rice, Chicago, Ill.
441. Hayden Automatic Block Machine Co., Columbus, O., J. E. Mathews.
442. W. R. Kennedy, Terre Haute, Ind.
443. P. A. Bowsher, Terre Haute, Ind.
444. C. E. Martin, Piqua, O.
445. Harry L. Mooar, Columbus, O.
446. H. M. Young, Eaton, O.
447. Joe Troempeter, Peru, Ill.
448. E. F. W. Weberling, Peru, Ill.
451. S. C. Elmore, Martinsville, Ind.
452. G. W. Dyarman, Columbus, O.
453. J. M. Rush, Danville, Ill.
454. Homer Rush, Danville, Ill.
455. J. P. Heckman, Creston, O.
456. Frank Koepfle, 22 15th-st., Cincinnati, Ohio.
457. Orin A. Swan, Kankakee, Ill.
458. John Devere, Kankakee, Ill.
459. H. L. Avery, Akron, N. Y.
460. James R. Thomas, Akron, N. Y.
461. H. O. Van Meter, Kankakee, Ill.
462. W. M. Hilderbrand, South Bend, Ind
463. Harry Kemble, South Bend, Ind.
464. D. H. Kirwan, Rushylvania, O., Union Portland Cement Co.
465. H. Smith, Kankakee, Ill.
466. Kelly E. Jackson, Chicago, Ill.
Illinois Steel Co., Cement Dept., Chicago, Ill.
467. B. F. Affleck, Chicago, Ill.
468. J. C. Van Doorn, St. Louis, Mo.
469. C. K. Walker, Chicago, Ill.
470. B. H. Rader, Chicago, Ill.
471. E. S. Larned, Boston, Mass.
472. C. F. Perkins, Danville, Ill.
474. Col. R. Cromer, Logansport, Ind
475. L. R. Harshman, Sullivan, Ind.
476. G. W. Simmons, Richmond, Ind.
477. H. A. McKinnon, Ashtabula, O.
478. Chas. Cook, Mooresville, Ind.
479. Dan E. Petro, Cambridge City, Ind.
480. Willard Ulrich, Cambridge City, Ind.
481. W. A. Roth, Cambridge City, Ind.
482. Wm. C. Lantry, Milwaukee, Wis.
483. Alfred Meurer, Janesville, Wis.
484. Gen. H. A. Wheeler, Northwestern Expanded Metal Co., Chicago, Ill.
485. J. F. Golding, Washington, D. C.
486. Arthur D. Metcalf, Princeton, Ind.
487. O. W. Cotton, Shelbyville, Ind.
488. C. A. Rupp, Buffalo, N. Y.
489. Chas. De Witt, Michigan City, Ind.
490. Geo. C. Rood, Indiana Fuel Co., Michigan City, Ind.
491. W. A. Thornburg, Farmland, Ind.
492. Cabell B. Hall, Louisville, Ky.
Dunn Bros. Lithogen Stone Co., Muncie, Ind.
493. H. E. Dunn, Muncie, Ind.
494. D. Minick, Muncie, Ind.
495. Chas. Mankedick, Sullivan, Ind.
496. Alfred Mankedick, Sullivan, Ind.

497. Wm. Pierron, Milwaukee, Wis.
498. J. F. Roddefer, Elwood, Ind.
499. B. Schatzinger, Cleveland, O.
500. S. E. Atwater, Cleveland, O.
501. Chas. Gonghour, Canton, O.
502. A. E. Wright, Canton, O.
503. A. A. Atwater, Cleveland, O.
504. W. J. Coyner, Terre Haute, Ind.
505. Geo. E. Altman, Edinburg, Ind.
506. M. A. Howe, Terre Haute, Ind.
507. Isaac Chew, Anderson, Ind.
508. S. Simendorg, Cleveland, O.
509. P. B. Stout, Sheridan, Ind.
510. W. H. Miller, Tipton, Ind.
511. Harry McKay, Indianapolis.
512. E. W. Howell, Indianapolis.
513. J. E. Dennis, Buffalo, N. Y.
514. Geo. Saunders, Greensburg, Ind.
515. Robert Neagel, Greensburg, Ind.
516. J. L. Jackson, H. H. Symmes Co., Indianapolis.
517. J. Harry Hale, Anderson, Ind.
518. T. J. O'Hara, Alexandria, Ind.
519. C. H. Defrees, South Bend, Ind.
520. R. Hasenwinkle, Bloomington, Ill.
521. L. M. Glass, Muncie, Ind.
522. Geo. W. Powers, Chicago, Ill.
523. Wm. Westergren, Millers, Ind.
524. Jas. M. Waugh, Crawfordsville, Ind.
525. D. L. Richard, Crawfordsville, Ind.
526. G. B. Lynch, Darlington, Ind.
527. H. C. Pomeroy, Indianapolis.
528. H. A. Mansfield, Indianapolis.
529. J. W. Sterns, C. E., Indianapolis.
530. H. F. Northrup, Gilford, Ind.
531. R. E. Sherrill, Haskell, Tex.
532. Wm. Bodley, Louisville, Ky.
533. Harry L. Powell, Mattoon, Ill.
534. J. A. Johnson, Winamac, Ind.
535. Will J. Cleary, St. Joe, Mich.
536. Earl Q. Jackson, Greenfield, Ind.
537. Louis E. Bogen, Cincinnati, O.
538. M. J. Collins, 911 W. 27th-st., Indianapolis.
539. J. E. White, 1257 Central-ave., Chicago, Ill.
540. Samuel Munnel, Cannonsburg, Pa.
541. A. M. Potter, Lewisville, Ind.
542. A. L. Armstrong, Eaton, O.
543. Allen R. Holden, Rushville, Ind.
544. W. M. Munson, jr., Mitchell, Ind.
545. J. W. Stewart, Paris, Ill.
546. J. G. Clough, Quincy, Ill.
547. D. C. Kochenderfer, Punxsutawney Quarry Co., Punxsutawney, Pa.
548. M. D. Roach, Harvard, Ill.
549. W. H. Ward, Harvard, Ill.
550. D. L. Gaskill, Hammond, Ind.
551. Wm. Coon, Frankfort, Ind.
552. F. G. Higgins, 1420 W. 30th-st., Indianapolis.
553. W. E. Colladay, Decatur, Ill.
554. Bert Brown, Lagrange, Ind.
555. A. C. Loomis, Mattoon, Ill.
556. D. P. Rose, Mattoon, Ill.
557. Lora Hutto, Sharpsville, Ind.
558. W. W. Ramsey, Chicago, Ill.
559. E. E. Banner, Sargent, Neb.
560. H. C. Wentz, Wapakoneta, O.
561. W. M. Runkle, Wapakoneta, O.
562. A. F. Gelhart, Decatur, Ill.
563. M. Joseph Downes, Lebanon, Ind.
564. A. J. Hostetler, Mitchell, Ind.
565. Wm. Burford, Indianapolis.
566. John Hohn, Indianapolis.
567. W. G. Fluegel, Warsaw, Ind.
568. Carl Beyer, Warsaw, Ind.
569. J. A. Harding, Crawfordsville, Ind.
570. Samuel Hursh, Galveston, Ind.
571. J. W. Hensley, Indianapolis.
572. E. W. Shirk, U. S. Cement Co., Bedford, Ind.
573. F. B. Darmger, Newcastle, Ind.
574. Samuel Dingle, Newcastle, Ind.
575. David Amond, Newcastle, Ind.
576. Daniel Cleary, Indianapolis.
577. Chas. Ferguson, Hillsdale, Mich.
578. W. B. Featherstone, Hillsdale, Mich.
579. Geo. C. Bedell, Indianapolis.
580. Paul H. Lieske, Indianapolis.
581. E. C. Webber, Miamisburg, O.
582. W. L. Bishop, Rochester, N. Y.
583. D. H. Allen, Miamisburg, O.
586. W. C. Allen, Indianapolis.
587. William A. Bibler, Arlington, O.
588. A. J. Meidroth, Peoria, Ill.
589. A. E. Taylor, Chicago, Ill.
590. P. S. Johnson, Chicago, Ill.
591. M. P. Worley, 1819 Fairview-st., Anderson, Ind.
592. E. A. Enos, Connersville, Ind.
593. D. A. McBride, Chicago, Ill.
594. Fred Asp, Chicago, Ill.
595. David M. Kennedy, Detroit, Mich.
596. Marquette Portland Cement Co., Chicago, Wm. Dickinson.
597. John Miller, C. E., Sandusky, O.
598. J. C. Henderson, Chicago, Ill.
599. Chas. F. O'Donnell, Buckeye Portland Cement Co., Bellefontaine, O.
600. J. S. Hazelrigg, Cambridge City, Ind.
601. Clarence Carnery, Rushville, Ind.
602. W. H. Cherry, Rushville, Ind.
603. H. H. Guffin, Indianapolis.
604. L. P. Boyles, 300 W. Jackson-blvd., Chicago, Ill.
605. H. E. Cotton, Brownstown, Ind.
606. C. W. Hocker, Brownstown, Ind.
607. W. F. Kerlin, Rockfield, Ind.
608. H. L. Weber, Richmond, Ind.
609. Fred R. Charles, Richmond, Ind.
610. H. F. Schrader, Evansville, Ind.
611. Chas. Hanika, Muncie, Ind.
612. T. J. Reed, Wellsburg, W. Va.
613. D. L. Mather, Richmond, Ind.
614. H. R. Miles, Upland, Ind.
615. D. W. Norton & Co., Vincennes, Ind.
616. Clark Cement Co., Pendleton, Ind.
C. A. Clark.
E. D. Allen.
617. B. Fay Kelley, Claypool Hotel, Indianapolis.
618. J. H. Cooley, 6322 Drexel-ave., Chicago.
619. Ed. W. Barrows, 3236 N. Illinois-st. Indianapolis.
620. E. Bader, Worswick Paving Co., Fresno, Cal.

The Exhibits.

The following is a list of the exhibitors at the convention in the order of their application for space. Descriptions of a

number of the exhibits will be found on subsequent pages. The names of the representatives present will be found under the names of the companies in the registration list of the convention.

Ralph & Wiest, Indianapolis, Ind. The Miles concrete block machine and the Seamans brick machine.

The Cement Machinery Co., Jackson, Mich. The Normandin hollow concrete block machine.

The Contractors' Supply and Equipment Co., Chicago, Ill. The Smith concrete mixer.

The Auburn Concrete Machinery Co., Auburn, Ind. The Ideal hollow concrete block machine

Ricketson Mineral Paint Works, Milwaukee, Wis. Mortar colors.

Brady Cement Stone Machine Co., Jackson, Mich. The Brady hollow concrete block machine.

Indianapolis Cement Products Co., Indianapolis, Ind. The Miracle hollow concrete blocks and machinery.

Noyes F. Palmer Mfg. Co., Brooklyn, N. Y. The N. F. Palmer hollow concrete block machine.

U. S. Cement Shingle Machinery Co., Saginaw, Mich. Zwerk's cement shingles on a roof and the machine for making them.

Blakeslee Concrete Block and Machine Co., Columbus, O. The Blakeslee hollow concrete block machine.

E. W. Seamans, Grand Rapids, Mich. The Seamans block and brick machines and indurating process.

The National Building Block Co., Milwaukee, Wis. The products of the National two-piece block machine.

Harmon S. Palmer Concrete Building Block Machine Co., Washington, D. C. The H. S. Palmer hollow concrete block machine.

H. E. Goodwin, Indianapolis, Ind. The Goodwin hollow block machine.

Pettyjohn Bros., Terre Haute, Ind. The Pettyjohn concrete block machine.

Cleveland Car Co., West Park, O. Cars for transporting blocks.

Winget Concrete Machine Co., Columbus, O. The Winget hollow concrete block machine.

E. H. Defebaugh, Louisville, Ky. "Rock Products" magazine.

Standard Sand and Machine Co., Cleveland, O. Simplicity hollow concrete block machine and concrete mixer.

Associated Expanded Metal Companies, New York City. Expanded metal forms and sidewalk slab.

Century Cement Machine Co., Rochester, N. Y. Hollow concrete block machine.

Universal Concrete Machinery Co., Norfolk, Va. Model of hollow concrete block machine.

Municipal Engineering and Contracting Co., Chicago, Ill. Concrete mixers.

Municipal Engineering Co., Indianapolis, Ind. "Municipal Engineering," magazine. "Directory of American Cement Users" and "Handbook for Cement Users."

Gross & Horn, New York City. Dehydratine.

Cottom Artificial Stone and Mfg. Co., Dayton, O. Cottom hollow concrete block machine.

Simon L. Dunlap, Indianapolis, Ind., Mold for building cement cisterns.

Atlas Portland Cement Co., New York City. Cement, material of which it is manufactured and products.

Hayden Automatic Block Machine Co., Columbus, O. Hayden hollow concrete block machine.

J. W. Cooper, Minneapolis, Minn. Hollow concrete block machine.

International Fence and Fireproofing Company, Columbus, O. Reinforcing for concrete and fireproofing system and concrete mixer model.

Castalia Portland Cement Company, Pittsburg, Pa. Travertine, clay and cement.

Automatic Building Block Machine Co., Jackson, Mich. Hollow concrete block machine.

Chase Foundry and Mfg. Co., Columbus, O. Transferring and drying truck.

Dever Cement Tank and Silo Co., Cassopolis, Mich. Concrete tank model.

The Bonnot Co., Canton, O. Concrete mixer.

Western Cement Co., Louisville, Ky. Bricks of Louisville cement, sand and a chemical.

Huntington-Miller Co., Jackson, Mich. Concrete block machine.

Porter, Taylor & Co., Chicago, Ill. "The National Builder," magazine.

Concrete Publishing Co., Detroit, Mich. "Concrete" magazine.

St. Louis Portland Cement Co., St. Louis, Mo. Portland cement literature.

Whitehall Portland Cement Co., S. J. Vail, Chicago, Ill. Portland cement literature.

St. Louis Crushed Quartz Co., St. Louis, Mo. Broken stone for special concrete work.

Stringer Machine Co., Jackson, Mich. Concrete block machine.

Roman Stone Co., Chas. S. Watson, Mgr., Toronto, Ont. Photographs of buildings, etc., of cast stone.

J. H. Catherman & Son, Elkhart, Ind. Model of the Ideal cement post.

O. M. Jumper, Wheatfield, Ind. Cement sidewalk tools.

MUNICIPAL AND TECHNICAL LITERATURE

Municipal and State Reports.

Thirty-first Annual Report of the Lowell, Mass., Water Board, 1903. George Bowers, City Engineer.

This is one of the few plants in which the expenditures were greater than the receipts, the former being $200,342.47 and the latter $196,127.20. Coal cost over $25,000 more in 1903 than in 1902, although 238 tons less were burned, accounting for the deficit. The expenditures included $21,600 of loans repaid and $48,190 interest, and $32,514.33 for construction, so that the works are self-supporting and turn part of their annual receipts back into the capital account.

A peculiar accident happened during the year. Mills along the river have private fire service drawing from the river, which are connected with the city pipes on the premises. During a fire in one plant the city pressure was sufficient to overcome the pressure from the plant's private reservoir when drawn down, but after the fire, when the company attempted to fill its reservoir again, it was found that the check valve intended to prevent the polluted river water in the private system from flowing into the city mains did not operate and a considerable amount of this water was forced into the mains, causing 168 cases of typhoid fever and other bowel troubles. As a result of this difficulty the connections open to this danger have been discontinued and other arrangements made for fire protection.

Fourth Annual Report of the Department of Public Works, Rochester, N. Y., 1903. Edwin A. Fisher, City Engineer.

One or two special reports upon department conditions are contained in this volume which are of interest. Mr. B. C. Little, the superintendent of the water works, made an investigation to determine the reason for the discrepancy, some 80 or 90 per cent, between the amount of water pumped by the Holly fire system, as shown by the counters on the pumps, and the metered and estimated amount used. The system was tested in detail for leaks by shutting down a gate in the main controlling a certain section, and passing the water by means of a hydrant on the down side of the main from the gate through a hose and meter and thence through a hydrant on the up side of the gate. In no case was a consumption shown which was greater than that expected from a knowledge of the consumers, this indicating that there were no leaks of any consequence. The delivery of the pumps was then tested and it was found that with a water pressure of 50 to 65 pounds and an average of 13 or 14 revolutions a minute there was about 40 per cent slippage in the pumps. When the number of revolutions was increased to 26 a minute the slippage was reduced 10 per cent, and with a pressure of 86 pounds the slippage was still further reduced. It is therefore difficult to measure the amount of water pumped, in the absence of a meter on the main. Ordinarily the water is pumped by water power so that the slippage at low pressure is not of much moment. When fire pressure is put on by use of the steam plant the slippage is reduced to a more reasonable percentage and there is not a serious loss of coal on this account.

The card system is used for indexing public improvements and samples of the cards are given in the report. A yellow card is used for sidewalk improvements, showing kind of walk and curb and amount of grading, limits of the work, character, width of grading, roadway and walk, length, cost, number of ordinance, name of contractor, date of completion, name of measuring engineer, number of ward, name of inspector and page and book of record of field notes.

A salmon card is used for sewers showing size and kind of sewer, limits of extent, length, depth below surface, cost, date of completion, number of ward, number of ordinance, name of contractor, area assessable for the improvement, names of measuring engineer and inspector and location of field notes.

A blue card is used for paving, showing kind and character, limits of extent, width between curbs, width of walk, length, width of street, cost, date of completion, number of ordinance, names of contractor, measuring engineer and inspector, ward and location of notes.

A full record of location of lot, lateral sewers, water services, surface sewers, Y-branches, hydrant drips and miscellaneous work is kept for each lot, showing owner, number of house and lot, location, foreman, character and depth of the connection laid, exact location with reference to a lot line, the curb, a manhole, etc., descriptions and sketches of special work and locations needing the same.

In 1893 and 1894 about twenty-six miles of 38-inch steel pipe water conduit, ¼ to ⅝-inch thick, was laid from Hemlock Lake. The first leak on the ¼-inch pipe was reported in May, 1900, after six years and eight months in the ground. On another section five-sixteenths-inch thick the first leak was reported in March, 1903, after eight years and ten months, the intervals being approximately proportional to the thicknesses of the pipes. Two leaks were reported in 1900, ten in 1901, five in 1902 and fifteen in 1903. After the investigations of 1901 and 1902, the method of renewing the protection to the pipe adopted has been to clean off the old coating thoroughly, to remove the contents of the rust pits as far as possible with a sharp instrument, and to heat the spot sufficiently to dehydrate any remaining rust, carefully protecting the cleaned pipe from rain or other moisture. To the clean outer steel surface is applied a coat of superior graphite paint, No. 501, which is allowed to dry for a week or more, when a coat of the same paint, No. 106, is applied. After another week of drying two coats of mineral rubber paint, G. B., are applied with an interval of two or three days between the applications. If time does not permit the same painting of the inside surface, the two coats of mineral rubber paint, G. B., only are used.

Tenth Annual Report of the Board of Health of Montclair, N. J., to June, 1904. Charles D. Thompson, President.

This board is a working board, having held twenty-four meetings during the year, and, although Montclair is a town and not a large city it employs four inspectors, a chemist and bacteriologist and an attorney in addition to the free services of the five members of the board. The total expenditures for the year of the report were $8,178, of which $2,986 were for the suppression of smallpox, although there were but four cases and no deaths.

The attorney reports twenty-four complaints and search warrants, nearly all of which resulted in pleas of guilty and satisfactory settlement.

The chemist reports twenty-eight analyses of water and ice, showing a good town supply, some good wells and some of suspicious quality, and samples of natural ice superior in quality to artificial ice. Bacteriological analyses were confined to cultures of disease germs, over 700 of suspected diphtheria and a few each of typhoid fever, malaria, and tuberculosis.

The total number of deaths in the town was 312 and, deducting ninety-five non-residents who died in the hospitals, corresponds to 12.51 per thousand. Births were 305, or 17.58 per thousand of population. Marriages were ninety-three in number or 5.36 per thousand. One assistant tested 532 plumbing jobs and issued permits for plumbing and sewer connections. Another tested milk from the various dairies at monthly intervals and gives a report in detail regarding each dairy. The third assistant inspected ninety-nine gas piping jobs.

The stagnant ponds in the town have received coatings of oil at proper times to prevent the growth of mosquitoes and the drainage of the ponds is recommended to stop this continuing expense. Nuisances to the number of 393 were investigated during the year, nearly all from deposits of filth in lots, yards or outbuildings. The scientific attention of this board to its duties is to be highly commended.

Report on a High Pressure Salt Water Main and Pumping Station for Fire Service at Atlantic City, N. J. Kenneth Allen, Superintendent of Water Works.

This report is published by the Atlantic City Board of Trade in connection with its committee report approving the project and asking the council for funds to establish it. The estimates are made in some detail and show that a pumping station using gas for power would cost $180,200 and $24,688 a year to run and one using electricity would cost $86,000 and $21,574 a year to run. The distribution system would cost $114,200.

The report contains a list of the high pressure fire services now in use or proposed, with data of their extent, service and cost per acre of area covered. Those in use, with the cost per acre of area are Boston, $461; Buffalo, $279, Cleveland, $180; Detroit, $135; Milwaukee; Philadelphia, about $700; Providence, $390. Those proposed are Atlantic City, Brooklyn, Chicago, Coney Island, Newark, and New

York. All those in operation derive their pumping power from fire boats except Providence, which is a gravity supply, and a part of Philadelphia which is from a pumping station in addition to five fire boats.

Annual Report of the City Engineer of Toronto, Ont., 1903. C. H. Rust, City Engineer.

A graphical diagram shows the variations in expenditures in the City Engineer's department. They have been nearly $1,000,000 for each of the past four years, being slightly more in 1903. The expenditures in the water works department reached $200,000 in 1903.

The difficulties in estimating population in advance are shown by a table comparing the estimates when extensions of the water supply were planned. Starting with a deficiency in the estimate in 1895 of 16,000, one of 45,000 was reached in 1903.

On account of competition asphalt pavement prices have been reduced 30 per cent below those prevailing in 1901. Stone curb is abandoned in favor of combined concrete curb and gutter on these streets. Brick has become very popular and so has tar macadam with brick gutters, though one street was not good on account of inexperience of the contractor. Two concrete roadways were laid, one where there is considerable travel. They are cheaper than asphalt or brick if they prove to be as durable. The base of these pavements is 4-inch concrete with a wearing surface 2½ inches thick of concrete made of one part cement, one part sand and three parts fairly coarse crushed granite. The surface is finished with woolen floats and deeply grooved in blocks five by ten inches, about fifteen inches along the curb being left smooth for gutter. At distances of twenty feet apart the entire pavement is cut through for an expansion joint ¾-inch wide, filled with paving pitch. There is a similar joint along each curb and at each twenty feet of width of a street more than twenty feet wide.

ORGANIZATIONS AND INDIVIDUALS

Michigan Engineering Society—Northwest Concrete Products Convention—Technical Meetings—Personal Notes.

Michigan Engineering Society.

The twenty-sixth annual convention of the Michigan Engineering Society was held at Lansing, Mich., Jan. 11, 12 and 13. W. W. Brigen, city engineer of Battle Creek, chairman of the committee on municipal affairs, submitted a report for the committee embodying a model street railway franchise. The committee took the franchise in use in Battle Creek, with a few minor modifications, which was granted in December to the Battle Creek & Grand Rapids Inland Lake Traction Co. The franchise is for twenty years and the municipality reserves the right to purchase the property of the company lying within the city limits at any time during the life of the franchise, payment to be in cash or 4 per cent bonds the value of the plant to be determined by a board of arbitration, consisting of three members, appointed by a circuit judge of the county. The company has the option, in case of purchase to lease the use of the tracks for an annual rental which shall not exceed 4 per cent of the purchase price. Should the city, at any time during the twenty years, grant a franchise to another company, the new company shall have the right, if it so desires, of renting the tracks of the old company.

The society did not accept this report as a whole, but decided to embody it in its annual proceedings.

Some of the papers submitted were: "Municipal Ownership," Prof. Davis, of the University of Michigan; "The Pintsch

Suction Gas Producer." Schuyler F Seager; "Methods of Figuring Costs," C. E. Bement. Prof. C L. Weil, of the Michigan Agricultural College, described the new central heating and power plant and the tunnel system installed there at a cost of $130,000, and W. H. Goss described a concrete pump pit built at Bangor, Mich., during the last year. The committee on roads and paving submitted a report in which considerable space was given to the discussion of tarmacadam pavement.

The nominating committee submitted names for officers of the society as follows: President, H. K. Vedder, Agricultural College; vice-president, A. C. Lane, Lansing; secretary, F Hodgman, Climax; treasurer, A. L. Holmes, Grand Rapids. The election will be by letter ballot the latter part of January.

Northwest Concrete Products Convention.

The Northwest Concrete Products Convention was convened in the court house at Minneapolis on Tuesday afternoon, Jan. 24.

The purpose of the convention was announced to be the bringing together of the architect, engineer, contractor, builder and cement user. A. O. Miracle of Minneapolis was made temporary chairman and committees on organization and officers were appointed.

James G. Houghton, building inspector of Minneapolis, spoke upon reinforced concrete construction and building blocks.

Five of the papers on the program were the same as presented at the Indianapolis convention.

Prof. F. H. Constant of the University of Minnesota gave an extended talk on the work of the university in following up concrete construction by tests and experiments.

F. W. Cappelen, C. E., of Minneapolis, gave an interesting talk on his experiences with reinforced concrete construction.

The Rev. J. W. Sheehan of Belden, Mich., gave his experience in building a church of concrete building blocks.

C. L. Ilstrup, sewer engineer of Minneapolis, gave a detailed account of the construction of reinforced concrete sewers.

W. S. Hewitt of Minneapolis talked about concrete bridges.

For lack of space abstracts of the talks and discussions are postponed to a later number.

A permanent organization was formed with A. O. Miracle as president; F. H. Chapin, secretary, and John M. Hazen, treasurer, all of Minneapolis. Five vice-presidents of sections were selected: James Wimmer, Perry, Ia.; Ernest McCullough, Chicago; E. H. Dow, Sioux Falls, S. D.; J. W. Cooper, Minneapolis, and H. G. Stanley, Hope, N. D.

The convention continued its sessions on Friday.

The attendance was gratifying, about 170 registering each of the first two days.

Technical Meetings.

The next annual meeting of the National Electric Light Association will be held in Denver, Col., in June, 1905.

The nineteenth annual convention of the National Brick Manufacturers' Association will be held at Birmingham, Ala., Feb. 6 to 11. T. A. Randall, secretary, Indianapolis, Ind.

The annual meeting of the American Association for the Advancement of Science and of the American Physical Society was held in Philadelphia from Dec. 26 to Jan. 2. Prof. W. G. Farlow, of Harvard, was elected president to succeed Hon. Carroll D. Wright.

The twenty-fifth annual meeting of the Iowa Brick and Tile Association was held at Ottumwa, Ia., Jan. 18 and 19. Officers for the ensuing year were elected as follows: President, Chas. A. Rawson, Des Moines; vice-president, J. L. Stevens, Boone; secretary, L. W. Denison, Mason City; treasurer, C. J. Holman, Sargents Bluff.

The annual meeting of the American Society of Civil Engineers was held at the Carnegie Lyceum, New York City, Jan. 18. The report of the board of directors showed a net increase in membership of 279, making the total membership on Jan. 1, 3,203. Reports were submitted from the committees on uniform tests of cement, on rail sections and on concrete and concrete-steel. At the request of the last-named committee the term "concrete-steel" was changed to "reinforced concrete." The society voted, on motion of Samuel Whinery, to request that the board of direction to investigate the desirability of having the society, through the board, suggest the names of men qualified to serve on important technical commissions when so requested.

This report is to be submitted at the next annual meeting. The subject was discussed by a number of speakers, and while many were opposed to the adoption of the policy, the general opinion was that the matter was too important to decide without giving all members an opportunity of expressing their views.

The next convention will be held in Cleveland in June. Officers were elected as follows: President, C. C. Schneider; vice-presidents, M. L. Holman and Emil Kuihling; treasurer, Joseph M. Knap; directors, Ausin L. Bowman, Morris R. Sherrerd, H. Bissell, Edwin A. Fisher, William B. Dandreth and George S Pierson.

The annual dinner of the New England Water Works Association was held at the Hotel Brunswick, Boston, Jan. 11. The association, for the first time in its history, entertained ladies at its annual dinner. A paper on the water supply of Manila and life in the Philippines was read by Desmond FitzGerald. Officers were elected as follows: President, George Bowers of Lowell, Mass.; vice-presidents, James Burnie, Biddeford, Me.; Frank A. Andrews, Nashua, N. H.; George E. Crowell, Brattleboro, Vt.; Frederick W. Gow, Medford, Mass.; Edmund W. Kent, Woonsocket, R. I.; Charles E. Chandler, Norwich, Conn.; secretary, Willard Kent, Narragansett Pier, R. I.; treasurer, Lewis M. Bancroft, Reading; editor, Charles W. Sherman, Boston; advertising agent, Robert J. Thomas, Lowell; additional members of executive committee, Frank E. Merrill, Somerville, Mass.; George A. Stacy, Marlboro, Mass.; James L. Tighe, Holyoke, Mass.; finance committee, W. W. Robertson, Fall River, Mass.; R. C. P. Coggeshall, New Bedford, Mass.; Henry L. Thomas, Hingham, Mass.

The seventeenth annual meeting of the Iowa Engineering Society was held at Iowa City, Ia., Jan. 11, 12 and 13. Some of the papers were as follows: "Topographical Survey of Meandered Lake Beds," L. E. Ashbaugh; "Assessing Cost in Drainage Districts," George M. Thompson; "Rebuilding the Muscatine Water Works," J. J. Ryan; "Inaugurating Sewer Construction and Some Defects in the Iowa Sewer Laws," Charles P. Chase; "The Bacteiological Examination of Water as it Conveins the Sanitary Engineer," Dr. Henry Albert; "Sewerage System of Des Moines, L H. Stone; "Municipal Engineering For Small Towns," R. B. Slippy; "Water Problem in a City of 18,000 People," C. T. Wilson; "The Marshalltown Reservoir," C. A. Baughman; "Cement and Concrete Construction," Chas. P. Chase; "Iowa-ave. Culvert, Iowa City," Prof. C. S. Magowan; "Concrete Dam at Manchester, Ia.," B. J. Lambert; "Concret Steel Bridge, Kankakee, Ill.," J. B. Marsh; "Notes on Cost of Relaying Brick Pavement with Cement Filler," C. A. Baughman.

Officers were elected as follows; President, J. D. Wardle, Cedar Rapids; vice-president, L. E. Ashbaugh, Ames; secretary-treasurer, B. J. Lambert, Iowa City; directors, W. H. Jackson, Des Moines; Arthur J. Cox, Iowa City.

The annual meeting of the Arkansas Good Roads Association was held at Little Rock, Ark., Jan. 18 and 19. Among the papers presented were the following: "Wide Tires," J. M. Heiskell, Memphis, Tenn.; "Road Tax and Its Distribution," Hon. J. W. Livingston of Ouachite County, Ark.; "Effect of Good Roads on Railroad Interests," W. T. Taylor; "Arkansas Road Material," Col. J. A. Woodson; "Good Roads in Northeast Arkansas," County Judge L. B. Poindexter; "Farmers' Unions, Good Roads and Better Prices," N. Y. Foster; "State Road Engineer a Necessity;" E. A. Kingsley, City Engineer Little Rock; "Good Roads Secure Rural Delivery," Ex-County Judge Taylor of Conway County.

The twenty-seventh annual convention of the Illinois Clayworkers' Association was held in Champaign Jan. 10 and 11. Prof. I. O. Baker of the University of Illinois submitted a paper on "Joint Fillers for Brick Pavements."

The Indiana Engineering Society held a successful convention in Indianapolis, Jan. 12, 13 and 14, the attendance being larger than usual, nearly half the membership being present at some time during the convention. The program carried out was that printed in the January number of Municipal Engineering Robert P. Woods was elected president, Charles C. Brown secretary, both of Indianapolis.

Personal Notes.

F. B. Locke has resigned as city engineer at North Adams, Mass.

J. B. Weddell has been reappointed City Engineer at Olympia, Wash.

H. G. Ludlow, inventor of the Ludlow valve, died recently at Troy, N. Y.

Emmett Smith has tendered his resignation as City Surveyor of Bayonne, N. J.

William S. Moore has been appointed city civil engineer at Mishawaka, Ind.

Alvin Bugbee has been elected superintendent of water works at Trenton, N. J.

John N. Heeney has been reappointed superintendent of water works at White Plains, N. Y.

C. C. Vermeule has been appointed superintendent of water works at East Orange, N. J.

Clarence A. Fowler, Poughkeepsie, N. Y., has been appointed county engineer of Dutchess County.

Harrison Stidman has been appointed superintendent of street cleaning in the District of Columbia.

George W. Bates has been appointed a member of the Water Board at Portland, Ore., to succeed Mr. Lewis.

Preston H. Porcheron has been appointed city engineer at Rome, N. Y., to succeed George C. Schillner.

Russell Robb has become a partner in the firm of Stone & Webster, electrical engineers, 84 State-st., Boston, Mass.

The Hon. Edward Staples, former mayor of Biddeford, Me., died in that city Jan. 16, aged sixty-eight years.

J. W. Kendrick, City Engineer at Birmingham, Ala., has been elected president of the Engineering Association of the South

Frederick A. McClure has been re-elected city engineer and Harrison P. Eddy superintendent of sewers at Worcester, Mass.

Ovid F. Winslow has been elected superintendent and Augustus C. Blain assistant superintendent of streets at Nashua, N. H.

Charles Wanzer has been appointed City Engineer to fill the office during the remaining six months of the term of W. C. Elliott, resigned.

The Hon. John A. Horton has been re-elected mayor at Belton, S. C., with A. R. Campbell, R. A. Lewis, J. W. Cox and J. L. Davis as aldermen.

F. Bader, a member of the firm of the Worswick Street Paving Company, Fresno, Cal., is on a trip East to investigate concrete building block machinery.

Robert Weir, for a number of years connected with the construction of the Croton Water Works, died suddenly at his home in Montclair, N. J., aged sixty-nine years.

Maurice F. Holahan, president of the Board of Public Improvements, New York City, under Mayor Van Wyck, died Jan. 15 at the New York Hospital of cerebral hemorrhage.

William Pierson Judson has announced his resignation from the office of Deputy State Engineer of New York, to take place Feb. 1, his private duties requiring his full attention.

Harry A. Cook, superintendent of the water department at Salem, Mass., died at his home in that city Jan. 10. Mr. Cook had been superintendent of the water department thirteen years, and re-elected to that position on Jan. 2.

The Alma Cement Company will remove their general sales office, Feb. 1, from the Land Title Building, Philadelphia, Pa., to Wellston, O. All communications should be addressed to the Alma Cement Co., Wellston, O.

J. P. Johnston has resigned as Western sales manager of the Alphons Custodis Chimney Construction Company, to accept that of general sales manager of the Weber Steel-Concrete Company, with offices in Chicago.

Leland Hodge has been elected water commissioner to fill the vacancy caused by the death of M. D. Borst, and William Reilly has been elected president of the board to fill the place of Mr. Borst at Cobleskill, N. Y.

Henry I. Budd, State Commissioner of Roads in New Jersey, died at his home in Mt. Holly, N. J., Jan. 14. Mr. Budd was appointed State Commissioner of Roads in 1895, and under his administration more than 1,000 State and county roads were built.

D. W. Pike has resigned as city engineer of Kansas City, Mo., and will devote his time to the engineering firm of Pike & Tuttle. He will be succeeded by Edgar A. Harper, who has been connected with the city engineering department for fifteen years

Francis Leupp has been appointed Commissioner of Indian Affairs, at Washington, D. C., to fill the vacancy created by the resignation of William A. Jones, who was appointed to the position in 1897. Maj. Charles F. Larabee succeeds Capt. A. C. Tonner as Assistant Commissioner of the Indian Bureau.

Maj. Henry B. Looker, surveyor of the District of Columbia, died at his home, 3100 Newark-st., Cleveland Park, Washington, D. C., Jan. 3, of congestion of the brain. Maj. Looker was forty-seven years old. He was a civil engineer, and for a number of years was engaged in the practice of his profession.

Walter G. Kirkpatrick has resigned as City Engineer of Jackson, Miss., and, under the firm name of Kirkpatrick & Johnson, will engage in the practice of civil and mechanical engineering at Jackson. Mr. Kirkpatrick had been City Engineer of that city for seven years.

Nelson P. Lewis has been reappointed chief engineer of the Board of Estimates of New York City. Prof. George G. Seaver of Columbia University and Dr. Cary T. Hutchinson have been appointed a commission to draw general plans and specifications for a municipal lighting plant.

Samuel Forter, Bellevue, Pa., chief engineer and vice-president of the Forter-Miller Engineering Company of Pittsburg, died recently aged fifty-four years. Mr. Forter invented the Forter water sealed gas producer, the Forter water sealed reversing valve, the Forter furnace charger, and many other patented devices.

William P. Richards, assistant engineer in charge of street extensions, has been appointed surveyor of the District of Co-

lumbia, to succeed the late Maj. Henry B. Looker. E. M. Talcott, assistant surveyor, will be tendered the position, and it is believed that he will accept the place of assistant engineer in charge of street extensions.

Webster Gasley, assistant engineer of the Louisville Water Company, Louisville, Ky., has resigned his place to become chief engineer and vice-president of the National Concrete Construction Company of Louisville. Mr. Gasley had been connected with the Louisville Water Company for seventeen years.

City engineers have been elected and re-elected as follows: Francis P. Cobb, Chicopee, Mass.; A. K. Crowell, Taunton, Mass.; Charles N. Wood, Norwalk, Conn.; Edward J. Johnson, Nashua, N. H.; Joseph H. Young, Fulton, N. Y.; W. H. Luster, jr., Elizabeth, N. J.; W. H. Lawton, Newport, R. I.; James L. Tighe, Holyoke, Mass.; Charles R. Felton, Brockton, Mass.; Winslow L. Webber, Gloucester, Mass.

The Widell-Finley Company, engineers and contractors, has been incorporated for carrying on a general engineering and contracting business and succeeds to the contracting business of G. Widell of Mankato, Minn. The company will make a specialty of all classes of foundation and substructure work, masonry and concrete structures, and the erection of steel and wooden bridges. The company has opened offices at 655-656 Monadnock Block, Chicago, and in Mankato, Minn.

W. W. Ewing, formerly engineer of tests of the New York City building department, and since 1902 chief engineer of the Compania Generale de Asfaltos y Portland, of Barcelona, Spain, has completed the cement works which he went to Spain to construct, has returned to the United States and associated himself as treasurer and chief engineer with the Thomas J. Brady Company, a new corporation recently organized to undertake building and other contract work, with offices at 1123 Broadway, New York City.

John P. K. Otis died at his home in Worcester, Mass., Dec. 31, aged fifty-two years. Mr. Otis was well known among water works superintendents. He entered the City Engineer's office in Worcester in 1869, and later attended a course at the Worcester Polytechnic Institute, from which he graduated in 1873. He was then appointed assistant engineer for the construction of water works at Springfield, Mass., where he served two years. He then accepted the position of engineer for the construction of water works at Portland, Me., which position he held until 1878. From 1878 to 1881 he was instructor in civil engineering at the Worcester Polytechnic Institute. In 1880 he became manager of the Union Water Meter Company of Worcester and in 1900 was made president of this company.

MACHINERY AND TRADE

Exhibits at the N. A. C. U. Convention and Other Machinery and Materials.

The Two-Piece System of Concrete Block Construction.

The American Hydraulic Stone Company of Denver, Colo., in reply to correspondents makes some interesting points for the two-piece system of concrete block construction from which the following is chosen to show the methods of construction used and the results obtained:

Stones passing a one-inch screen with graduated fine material to fill the voids are used, a quarter-inch facing of fine sand being used for facing. All is compressed under 60,000 pounds of pressure.

The concrete is moist enough so that when it is tamped or pressed, free water flushes to the surface. The stone breaks through the pieces when a block is broken, showing the complete bond thus obtained.

Two men at the press, one mixing with a power mixer and two carrying away blocks and sprinkling, or five men in all can make over 500 square feet of wall in ten hours. One more man is needed if the mixing is done by hand. Four men at the press, two at the power mixer or three by hand, and two men and a boy carrying away blocks and sprinkling can make over 1,000 square feet of wall in the same time.

The usual thicknesses of wall made with the blocks from the standard machine are 3½, 4½, 6, 8, 10, 12, 15, 16 and 17 inches, and any greater thickness can be pro-

vided for in blocks 12x24 or 9x24 inches.

The wall of two-piece blocks contains 50 per cent of air space.

The blocks weigh from 30 to 60 pounds each, according to thickness of wall for which they are intended, and are easily handled by one man. This results in a low cost per square foot for laying blocks in wall and in less loss from broken and damaged blocks. The hardness of the concrete also saves much breaking and crumbling of edges.

The facing of blocks is very satisfactorily done in the following manner: The mold is filled with a 1 to 7 mixture of coarse concrete. A quarter-inch depth is then raked out of the top of the mold and this space is filled with a 1 to 2 mixture of fine sand and cement, the pressing plate is put on and the pressure applied. The face is then the stronger part of the block and does not scale or peel.

The heavy pressure and the comparatively wet mixture produce a uniformly strong, dense stone

The bond of the wall made of two-piece blocks is said to be the strongest made. There is a header bond every seven to nine inches horizontally and every nine to twelve inches vertically.

Single blocks twenty-one days old, 12x24 for a twelve-inch wall, set on edge on a plank and unsupported otherwise showed a crushing strength of 2,600 pounds per square inch. These blocks were taken at random from a stock made for the building of the National Electric Co., Milwaukee, Wis.

Where the bonds above referred to come together a space is left between the webs so that an air chamber at least ¼-inch wide extends everywhere through the wall. Consequently moisture from the outside cannot make its way through the inner tier of blocks and plaster or decorations are safe from this trouble.

This block has recently had a severe trial by fire, which showes the value of the methods of combining the materials in making these blocks. The following is quoted from an article that appeared in the Estherville (Iowa) Enterprise, Wednesday, Jan. 11, 1905:

"In the fire which swept over our little city a few nights ago, the Davis Shoe Building (constructed of the American Hydraulic Stone Company's hollow concrete walls), during all the exposure to fire and water, stood as an impregnable barrier to the progress of the flames. There was a solid sheet of flames beating against the cement blocks composing the walls of the Davis building, and then there would be a copious application of cold water from the hose, and yet after all this test of heat and cold the blocks stood these extremes of temperature without any splitting or chipping of the blocks.

"The result is a surprise to many. Several of the special agents of the insurance companies involved in this fire made a very close inspection of the Davis building in order that they might be able to make an intelligent report to their companies, and one of them, a representative of a London company, said no ordinary brick wall would have withstood the alternate exposure to heat and cold that these cement blocks did, and another said that on properly cement block constructed buildings insurance companies would be warranted in materially reducing the cost of insurance on such risks.

"As will be noticed, the limestone trimming on the Coon block and the boulders in the foundation were badly split and broken by the heat and water, while the cement blocks seemed to be impervious to these counteracting effects. There is a point for builders in this. The inside of the walls of the Davis building was not in the least discolored by the heat, and at no time was it so hot that one could not hold his hand against them.

"The strength of the wall, too, is obvious from the fact that the three-story brick wall of the Coon building fell crushing against it, but did not affect it in the least.

"It was a thorough test of such building material, and the company who furnished it has reason to feel elated over the result."

Concrete Cisterns.

Mr. S. L. Dunlap of Indianapolis showed a system for building concrete cisterns and a section of a mold for the purpose which attracted favorable attention. The mold is adjustable so that cisterns of any diameter can be constructed with it, and, beginning at the bottom, the mold can be moved up as rapidly as the sections set, so as to permit continuous work until the cistern is completed. The system includes methods of connection of side walls with bottom and construction of dome and manhole with inlets, outlets and overflows.

The U. S. Cement Shingle Machinery Company.

Interesting for its novelty and the thorough manner in which the problems are worked out was the exhibit of the U. S. Cement Shingle Machinery Co. of Saginaw, Mich. On the same floor with

GEO. C. ZWERK, SAGINAW, MICH.
U. S. Cement Shingle Machinery Co.

the assembly hall was a section of roof showing the shingles in place and the method of laying and fastening them, and the solutions of the many problems of ridges, valleys and connections with walls and windows arising in a complicated form of roof. The machine on which the shingles were made was too large for the elevator, so that it was shown in a store room on the ground floor.

The day of the wooden shingle is rapidly passing and its place must be taken by something less destructible. A cement shingle is the next suggestion after slate and tile, and the relatively easy method of making cement roofing tiles gives this material a prominent position in competition with the older roofing tiles and slates. Another advantage is found in the ease with which fasteners can be included in the manufacture of the tile, thus greatly diminishing the trouble from lack of ability to fasten tiles securely to the roof frame which is found with both clay tile and slate.

The machine on which these cement tiles are made is simple and strong and is continuous in its action, and the system devised for handling and curing the tiles is comprehensive, so that the cost of the cement shingles is reduced to a minimum.

Mr. George C. Zwerk, the inventor of machines, process, reinforced shingle and nailing loop, was in charge of the exhibit as manager and president of the company, and demonstrations were therefore in the most competent hands possible.

The Chase Foundry and Manufacturing Co.

A very important part of the equipment of a concrete building block plant is the apparatus for handling the blocks. The Chase Foundry and Manufacturing Company of Columbus, O., showed cars for carrying blocks from the machine to storage which have many points of strength, adaptability and convenience.

The main frame of the car is of angle iron lapped at the corner and thoroughly bolted and braced. One or two decks of

C. P. WIDDICOMBE, COLUMBUS, O.
Chase Foundry and Mfg. Co.

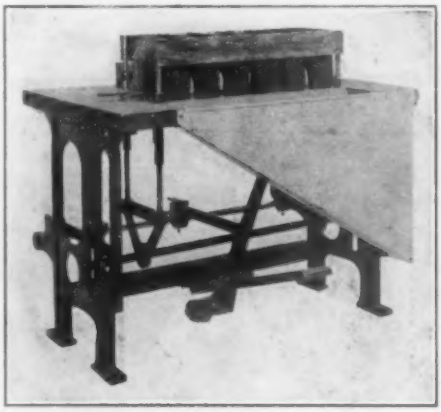
similar construction on angle iron legs can be set on the base frame if desired, these decks being held in position by corner blocks or nuts fitting on the inside of the angle iron legs and preventing slip.

Buffer springs and brackets are placed inside the angle ends, thus reducing the out-to-out length of the car. Economy

of operation of a plant operating with any approach to regularity demands such machinery as this, the cost of transfer of blocks to storage by hand increasing very rapidly as the distance from the machine to storage increases, while it is practically constant in the usual plant when this car is used.

The Hall Cement Brick Machine.

Mr. James P. Hall, foot of Henderson-st., Jersey City, N. J., is putting on the market a machine for making cement brick, which is shown in the accompanying cut. It makes six brick at each operation, run by one person, the brick being common, face or moulded as desired ,with sharp arrises or square corners, and of any size and thickness. The



THE HALL CEMENT BRICK MACHINE.

machine is light and easily run and the working parts are of cold drawn rolled steel, cast and wrought iron. Two men mixing their own material can make 2,000 brick a day at a cost less than $4 a thousand. Increase in number of men and addition of power for mixing and tamping will largely increase the rate and decrease the cost of manufacture.

Waterproofing Structures.

One of the most important questions before the National Association of Cement Users, if one may judge by the number of questions asked, was the waterproofing of walls of buildings. There was much discussion of this problem and several methods of solving it were proposed. Some substances for the purpose were exhibited. One firm, Toch Brothers, 468-472 West Broadway, New York. owing to late knowledge of the convention, was not represented and a description of their materials and methods of operation is given here.

The first process proposes the use of "Lockpore" or "Fluate," which is a transparent, colorless, indestructible coating for hardening and preserving stone, brick or artificial stone. The wall, stone, or brick, should be washed clean and the "Lockpore" can then be applied in the same manner that walls are washed down to free them from lime stain. This makes the surface impervious to moisture or dampness and also hardens it greatly. A second coat of "Anhydrosol" is then recommended. This is a cellulose, waxy material, which applied in liquid form, sheds water or moisture and prevents deterioration. The effect of these applications upon the outside of the wall or block is to make it waterproof, to harden it and to eliminate the effect of weather upon it.

Still another method of waterproofing a wall upon the inside, which prevents the objectionable action of moisture reaching the inside surface is offered. To the wall, whether brick or concrete block, a coat of "R. I. W." (Remember It's Waterproof) paint is applied. This paint is a thick black liquid made from a fusion of gums melted to make a uniform mass, which is partially absorbed into the wall and partially remains on the surface. Any moisture penetrating the wall from the outside cannot penetrate a good, continuous coat of the paint. The brown coat of

plaster can be applied directly to the wall after the paint is put on and will adhere very firmly, and the finish coat can then be applied as usual.

Either of these two methods can be applied to a wall and it is claimed by Toch Brothers that the result will be a waterproof structure. The reputation of Maximilian Toch, the junior member of the firm, as a chemist specialist in paints is international and any claim made by them carries great weight. The business of the firm is stated as "Specialists in Technical Paints, Colors, Chemicals and Raw Materials," and the present firm succeeded to the business some twenty years since.

E. B. McDOWELL, COLUMBUS, O.
Expert Demonstrator Winget Concrete Block Machine.

Any inquiries concerning materials and processes will be answered on request addressed to Toch Brothers, 468-472 W. Broadway, New York City.

The Evolution of the Winget Hollow Concrete Block Machine.

About five years ago, when hollow building block machines were practically unheard of by thousands who are now deeply interested in the live up-to-date subject of concrete construction, a block machine of unusual merit had its birth. At that time Mr. M. A. Winget, an inventive genius of Columbus, O., made application for letters patent covering the fundamental ideas of a machine for making hollow building blocks, the principal features of which were fixed cores, an automatic arrangement for opening and closing of the mold box and for tilting of the mold box so as to make a face-down block when it was desired.

Although the first block was as perfect as one could be, the first machine was somewhat rudimentary, but starting with the right principles the evolution was carried on till a machine was produced that embodies the valuable features required and eliminates the objectionable features.

The best block machine is the one that is most rapid, most complete, most adjustable as well as most quickly adjusted. A thorough investigation will show the completeness of the attainments of the Winget machine in these respects. The greatest speed, and therefore, economy, has been reached because of the automatic opening and closing of the mold box with one simple movement, thus delivering a perfect block in the shortest possible time.

This machine is quickly adjusted, insuring the greatest variety of shapes and sizes that are required in modern architectural designs, and no pains have been spared to equip it with the most complete attachments, so that it covers all kinds of construction, such as columns, curves, angles, chimneys, pilasters and many others.

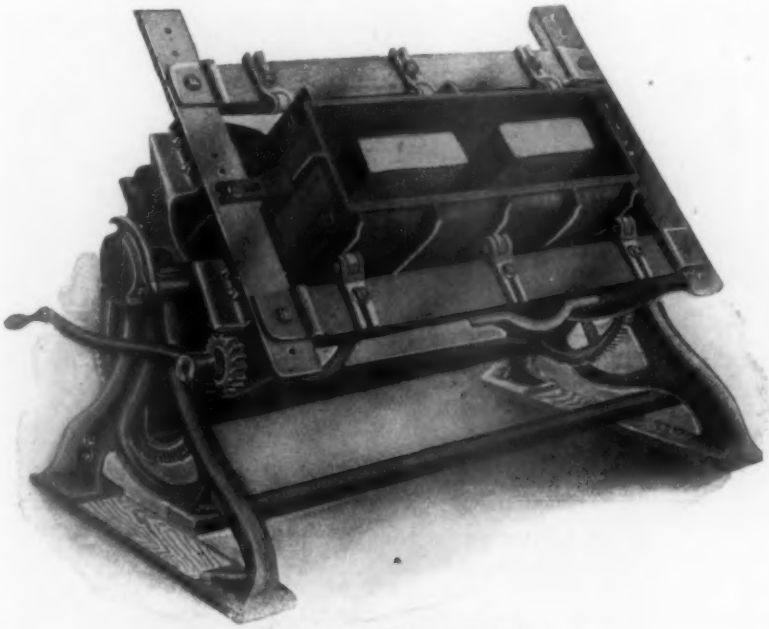
By means of cams and rollers the mold box is forced positively into position, always insuring blocks with sharp corners and perfectly true angles. There are no wearing parts to the mold box that would throw it out of adjustment, so that the blocks are always perfect in the design intended. While this machine is perfectly adapted to the making of face-down blocks with water-proof or colored faces, it does not lose its great advantage which makes it possible to have molded surfaces on several faces of the blocks. There is a growing tendency toward the making of blocks with a richer and stronger mixture, but of lighter construction. These blocks can be most readily made on the Winget machine without danger of their collapse, the pulling of cores from the side being avoided by the tilting device of the Winget machine. This is an important point and one that should not be lost sight of among the many points of superiority of the Winget machine.

Mr. E. B. McDowell, whose photograph accompanies, was the expert demonstrator of the Winget concrete block

machine at the convention. He has added a number of valuable improvements to the machine.

The Atlas Portland Cement Co.

The exhibit of the Atlas Portland Cement Company was one of the most attractive at the convention. The handsome glass case inclosing the display of samples of materials and products drew much favorable comment and the display of photographs, models and literature was interesting and instructive. The Atlas Portland Cement Company were pioneers in the use of the rotary kiln process for manufacturing cement, their Coplay works having been established early in the history of the cement industry in this country. The development of the plants belonging to the company has proceeded with the same phenomenal rapidity as the development of the cement industry in this country, so that the Atlas works have usually produced from one-fourth to one-third of the total cement manufactured in this country.



WINGET MACHINE, TILTED.

The mill at Coplay, Pa., was established in 1889. Four mills have been established at Northampton, Pa., at various times since that date and the latest mills of the company are the two at Hannibal, Mo. These seven mills have a capacity of 30,000 barrels of cement a day. This one company can, therefore, supply one-third of the demand for cement in the United States.

The company is one of the most active workers in the field of education of users of cement. An article like Rogers's "Railroad Concrete Masonry," from an engineering periodical, is reprinted in pamphlet form with the original illustrations and distributed wherever it will do good. Condensed specifications for artificial stone sidewalks are printed on cards for general dissemination. Comparative tensile and compressive strengths of various mixtures of concrete are made on cards for the same purpose.

The company's regular advertising pamphlets are models of the printer's art and give full information about the methods of producing Atlas cement and of storing and shipping it. A recent issue shows views of the machinery in use in the mills and of structures in which the cement has been used. The list includes the New York Central bridge over the Harlem, the Nashua Aqueduct, Northboro, Mass., Illinois Central track elevation, New York City docks, U. S. fortifications, masonry dam at Water-

bury, Conn., sidewalks, curb and gutter in many cities, and very many buildings in all parts of the country. The photographs of these buildings make the booklet an excellent birdseye view of contemporary American architecture.

The company has distributing agents throughout the United States. The general offices are at 30 Broad-st., New York City. The officers of the company are J. Rogers Maxwell, president; Alfonso de Navarro, vice-president; Howard Maxwell, treasurer; J. R. Maxwell, jr., assistant treasurer; Henry Graves, jr., secretary and H. J. Seaman, general superintendent.

In Municipal Engineering for November and December, 1904, were published some photographs of churches and of flats built of concrete blocks made on the Chicago machine. In this number are shown two factory buildings made of the same kind of blocks, thus showing a number of kinds of architectural work in which the use of these blocks nas had successful results. The first photograph is of a three-story factory building 40 by 80 feet in dimensions, owned by D. A. Laros. The second photograph is of the Inman planing mill. Both these buildings are in Grinnell, Ia., and the blocks were made on the Cement Machinery and

D. A. LAROS'S FACTORY, GRINNELL, IOWA.
Hollow Concrete Blocks, Chicago Machine.

The Cement Machinery and Manufacturing Company.

Mr. J. W. Sanderson, secretary and treasurer of the Cement Machinery and Manufacturing Company, Burlington, Ia., was on hand with information about the machinery manufactured by that company, including the "Chicago" concrete block machine, the Burlington rotary block machine, and machines for making sidewalk blocks, cement bricks, cement pipe and cement posts. Through a misunderstanding in the rush of the convention, Mr. Sanderson was unable to secure the space he desired for his exhibit, not having reserved space in advance. He was in evidence, however, about the convention halls and considered it a grand success and a great educator.

Manufacturing Company's "Chicago" machine by the Grinnell Stone Manufacturing Company.

Mr. Sanderson says that he met at the convention some thirty of those who have purchased machinery from his company and that they were all well pleased and felt well repaid with its results.

Seamans' Brick and Block Machines.

Mr. E. W. Seamans was present at the convention with all his enthusiasm for his machines for making concrete blocks, solid or hollow and for making brick. He also had much to say about his indurating process, which hastens the final set of concrete and at the same time, he claims, makes the concrete stronger.

His operating room was filled with interested observers of the simplicity of his machines and the methods of operating them. The brick machine, in particular, as the only representative of this particular form of concrete block, making ten bricks at a time, was an object of interest. It is difficult to imagine a simpler machine than the one Mr. Seamans has devised and at the same time it is so strong that it is not deformed by any proper usage, is so easily taken apart and reset that it can be operated rapidly and without injury to the bricks. The pallets are simply planks, so that the expense of accessories to the machine is a minimum. Two men handle the machine without trouble and with a man to mix concrete and carry away blocks can make brick very cheaply.

INMAN PLANING MILL, GRINNELL, IOWA.
Hollow Concrete Blocks, Chicago Machine.

The Harmon S. Palmer Hollow Concrete Building Block Co.

Harmon S. Palmer is unquestionably the originator in this country of what is correctly described as "A revolution in building methods." He stated that it has always been his desire to realize that he had produced something of benefit to mankind, and as he looked over the convention, after persistent efforts during twelve years of constant toil and expense, unaided and alone, he could not but feel a just pride when he saw so many who are now willing to acknowledge the merits of hollow concrete block construction.

Mr. Palmer from childhood has been known as an inventor, but like many others has wasted time and money on schemes and theories, only to find at the end that his energies had been misapplied and that the results were not wanted or appreciated by the public. In early life various patents were secured by him for farm implements, a knowledge of which he secured by daily contact in the field, having been born and reared on one of the fine farms in Jackson County, Mich. It was here in the year 1872 that he invented the non-decaying fence post, the bottom being first of brick clay and afterwards of concrete. On both of these posts he secured patents. Thus it will be seen that even at this early day he began the study of how best to serve the needs of mankind with concrete in its various forms.

At the age of eighteen years he began in the contracting and building business, an occupation which fitted him for perfecting the details necessary to the success of hollow concrete building block construction; he became familiar with the characteristics of all building materials as well as their cost and relative value; he learned the requirements of building construction in shapes and sizes of brick and stone, but in introducing the

hollow block some of the old methods had to be abandoned and a new era begun which employed a system throughout the whole structure; it is needless to describe here the various ways and means employed to arrive at results necessary to success when put upon the market; suffice to say that what now looks so easy required long and persistent study and much expense.

It should be borne in mind that years were necessary to convince men with money that loans were safe on this kind of constrcution, therefore money had to be procured in other ways and invested in these new buildings solely on the faith of the inventor. To say the least,

H. S. PALMER, WASHINGTON, D. C.
Harmon S. Palmer Hollow Concrete Block Machine Co.

many discouraging periods were passed, but like all other great improvements which have come to benefit mankind, some one had to be the pioneer, stand the brunt of expense and ridicule. In this case it was Harmon S. Palmer.

But little publicity had been given to Mr. Palmer's individual efforts or to his machine prior to an advertisement which was placed by Mr. W. W. Benson in Municipal Engineering in January, 1902. The attention of the magazine had been first called to the hollow concrete block late in 1901 and an investigation by the editor resulted in the illustrated article on the new building material which appeared in the same number, and in many articles in later numbers showing the extension of its use. The psychologic moment had arrived for the success of a campaign for publicity and Mr. Benson's reports of numerous letters by the first mail after the advertisement appeared have been duplicated by all advertisers of block machinery since. The development of the business from the start made by Mr. H. S. Palmer has been even more pronounced than the extension of the uses of cement in general in the past ten or twelve years.

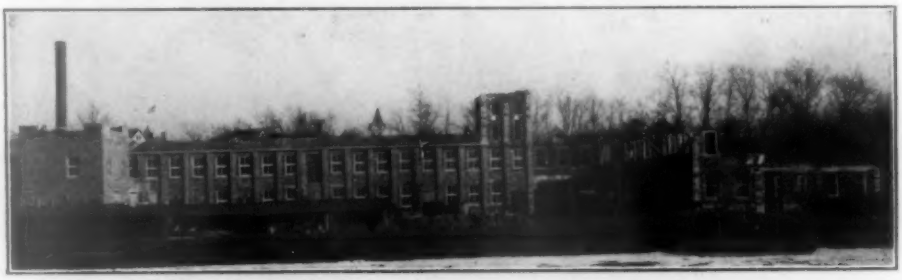
The Municipal Engineering and Contracting Company.

The concrete mixers had their full share of attention at the convention of the National Association of Cement Users, and Mr. Ernest McCullough, C. E., who represented the Municipal Engineering and Contracting Company, reported himself fully satisfied with the results. He showed a No. 5 curb concrete mixer on skids which attracted much favorable comment. This mixer has no "insides," being a simple cube with axis of revolution through two opposite corners. It will hold a batch of six cubic feet of loose concrete to the bottom of the openings and will mix thirty batches of perfect concrete in an hour. It is driven by any desired form of power and can be furnished on a wheeled truck or on skids, and with or without power. The power may be engine and boiler or gasoline engine or electric motor. It dumps by hand, is simple and strong and is self-cleaning. Larger mixers can be supplied up to a capacity of sixty-four cubic feet of loose concrete. A larger size mixer with power on truck was shown in actual work on a concrete arch under construction in the city. There was a pronounced demand at the convention, especially by the concrete block makers, for a mixer still smaller than the one shown and Mr. McCullough reports positive orders for a considerable number of such a size as the block makers can use to advantage and many more prospective orders. The machine is not yet constructed, but will be similar in design to the others in the stock series and evidently meets the needs of men using comparatively small quantities of concrete or requiring it in smaller batches. Mr. McCullough was ably assisted by Mr. C. H. Bathrick.

Concrete Building Block Industry.

No single industry has developed so rapidly during the past year as the manufacture of concrete building blocks. Every day people from all other businesses and professions inquire concerning some feature of this material. This industry has long since passed through the experimental stage. The accompanying cut shows a large planing mill erected by Geo. Mertz, Port Chester, N. Y., with blocks molded on the well known Simplicity machine. This firm is also using the Standard sand mixer for mixing material, as they not only find this a great labor saving device, but are thereby able to produce a better quality of blocks.

The building shown is 300 feet long by 200 feet wide and when completed another one of about the same size will be erected of the same kind of maerial. The



FACTORY AT PORT CHESTER, N. Y.
Standard Sand and Machine Company's Concrete Block Simplicity Machine.

Simplicity block machine is used extensively throughout the country, molding blocks for all purposes. This machine and the Standard sand mixer, power tamper, screen, dryer, elevating machinery, in fact all kinds of labor saving machinery are manfactured by the Standard Sand and Machine Co., Cleveland, O.

Molds for Special Forms of Cement Ornamentation.

The Concrete Construction Company, of Steubenville, O., was represented at the convention by Charles D. Floto, one of the four gentlemen of the same name interested in the company. They are contractors and builders for all kinds of cement work and makers of hollow concrete building blocks which are made fire, frost and damp proof. They manufacture the Floto dry process cement molds for making bases, balusters and balls. The product of their molds was used in ornamenting cement exhibits at the St. Louis Exposition and excited much favorable comment. It was doubtless a strong factor in securing the gold medal which was awarded for one collective exhibit. Special molds for ornamental blocks are a necessity in any concrete block plant which tries to fill all the demands for ornamental work which the architects may make.

The Model Block Machine.

The Concrete Block Machine Company of Auburn, Ind., is now putting on the market the "Model" concrete block machine, which is said to act on an entirely different principle from any other machine. Full description of the machine is not available at this time for publication and it will be illustrated in Municipal Engineering later. The machine has interchangeable molds and is specially designed to meet the requirements of the building art without cutting blocks. Cracked and warped blocks are said to be impossible on this machine.

The Ideal Cement Post.

A model of the "Ideal" cement post, shown by the inventors, J. H. Catherman & Son of Elkhart, Ind., attracted much attention at the convention. It is a concrete post, using barbed wire for reinforcement and has staples for fastening the fence which are imbedded in the side of the post before it hardens, after which they cannot be removed without breaking the post. Holes are also sometimes made in the post for fastenings of special nature.

W.F. COWHAM
MANAGER
S.L. WILTSE
SECRETARY
N.S. POTTER
TREASURER
L.P. NORMANDIN
SUP'T.

The Cement Machinery Company.

One of the largest exhibitors at the convention was the Cement Machinery Company of Jackson, Mich., exclusive manufacturers of the Normandin concrete block machines and devices. This company is composed of thorough business men of high standing. On the opposite page are shown the officers of this company. Mr. Cowham, the manager, is a well known cement manufacturer, a heavy stockholder in five of the largest cement mills in the United States and Canada. He is also president of the Peninsular Engineering and Construction Company of Jackson, Mich. Mr. Wiltse, the secretary, has had a wide business experience as a manufacturer of machinery and in concrete construction in general. For years Mr. Wiltse was connected with the Associated Press, which experience results now to his benefit in originality of methods for the interest of the company and the industry in general. Mr. Potter, the treasurer, is a well known and highly respected banker at Jackson. He is a cement enthusiast and is also a large stockholder in several cement mills. Aside from this Mr. Potter has other large holdings in the manufacturing industries of which Jackson is recognized to be a leader in Central Michigan. Mr. Normandin, the superintendent, is a skilled mechanic, for several years master mechanic in one of the largest car shops in the West, later was engaged by a large manufacturing concern in which hundreds of different machines were in operation as superintendent and expert, which position he held until he became connected with the Cement Machinery Company. He took up the problem of the use of cement, knowing that if properly mixed with sand or

Double residence, cost $6,500, Columbus, Ohio, on St. Clair Street just north of Mt. Vernon Avenue. Built exclusively of Normandin Blocks, the product of the Normandin Machines, by The Columbus Cement Stone Co., Columbus, Ohio.
(Equipped with 5 Normandin Machines.)

C. A. CHAMBERLAIN.
General Sales Agent.

other coarser materials it would form a stone. After considerable experimenting, making at least ten or twelve different block machines, he solved the problem from a mechanical standpoint. The Normandin machines have been on the market for years, having been among the first of the kind. They are used by the leading architects, contractors and builders and United States Government Engineers, after a six months' investigation, adopted and are using the Normandin machinery.

Mr. Wiltse, the company's secretary, when informed of the proposed convention, lost no time, but immediately wired the committee for space and offered all the assistance possible to make this convention a success. One week before its opening he was in Indianapolis making arrangements for hotel accommodations, arrival of machinery, advertising, selection of position. The Cement Machinery Company mailed over 5,000 circular letters to their customers and friends informing

L. D. McCLAFLIN.
Representative and Expert.

KIRK H. BROWN.
Expert Operator.

them of the importance of attending. As a result of this the majority of Normandin machine users were there gaily decorated with their Normandin red and white silk ribbon badges in connection with the convention barge.

The Normandin machines and devices were on exhibition in rooms 844 and 846 of the Claypool Hotel, at the entrance of the convention hall. A large, well selected and lettered sign reading "Cement Machinery Co., Jackson, Mich," adorned the space over the doors, and twelve display signs in three-color work, termed "catchers" in advertising, confronted all. On each card was an illustration of the head lines. On the right of each card ap-

peared the wording in connection with the head lines favoring the Normandin machines.

An elegant easel with a dupligraph of the Cowham System of Portland Cement mills thereon was in evidence. The Cowham system represents mills at Atlanta, Ga., Cement City, Mich., Durham, Ont., Hull, Que., and Independence, Kas.

Upon entering room 844 the company's representatives, S. L. Wiltse, C. A. Chamberlain, John P. Given, L. D. McClaflin, Wm. Phillips, M. J. Furnas and Chas. D. Floto were ready to greet all comers. Mr. Normandin demonstrated the machines personally.

In room 846 the many medals, diplomas and awards that the company has received for its machinery were on exhibition, notably among which were the highest awards received at the Universal Exposition at St. Louis, on both Normandin machines and product. Souvenir mirrors and cigars were generously distributed.

Prevents Sticking of Concrete Molds.

The South Bend Chemical Company of South Bend, Ind., presents a chemical solution for the purpose of relieving the trouble which many makers of concrete blocks and cement products have from sticking of the green concrete to the molds when they are removed as promptly as the operators desire. It is said that the application of this liquid by brush to any form of mold, either wood or metal, will prevent this sticking and that the concrete is not discolored, the coating remaining on the mold.

Expanded Metal.

The Associated Expanded Metal Companies were represented at the convention by Merrill Watson of New York City, who aided greatly in putting the organization of the convention upon a solid and permanent basis. The Northwestern Expanded Metal Company of Chicago was also represented by Gen. H. A. Wheeler.

Mr. Watson made some exhibit of expanded metal as a means of reinforcement and showed in particular a section of reinforced concrete walk or floor. He was much interested in the study of the hollow concrete block and the reasons for its rapid adoption and found a good argument in the fireproof quality of good block construction for the extension of the use of concrete to the floors of buildings, using expanded metal as the reinforcing material for such floors. His arguments were well received and the handsome catalogue he had on exhibition aided much in giving building contractors and block makers ideas of the many ways in which fireproof concrete floors on the expanded metal systems could be used with economy and advantage in connection with fireproof walls and partitions. The expanded metal suggestions shown in the catalogue extend also to

MERRILL WATSON, NEW YORK CITY.
Associated Expanded Metal Companies.

roof construction. Undoubtedly the combination of the concrete block with the reinforced concrete floor and roof would be exceptionally strong on the market, even when ultimate cost is a prime consideration.

Not only buildings, but also sidewalks, fireproofing, fences, sewers, circular, oval, rectangular, etc.; conduits, subways, filter beds, tanks, coal pockets, bridges, culverts, dock walls, hot wells, dry docks, coal shaft linings, light houses, stairways, etc., are legitimate places for the use of expanded metal.

Crushed Quartz for Concrete.

The St. Louis Crushed Quartz Co., 303 Roe Building, St. Louis, Mo., showed a full line of samples of the materials for granitoid sidewalks and concreting generally, which they put on the market as

crushed quartz. The uniformity in color of the stone and its hardness make it specially acceptable for use in granitoid sidewalks, floors, curbs and other places where the concrete is subjected to continual wear and must retain its good appearance. This company reports that the field for the use of its stone has been greatly extended and it is now prepared to supply it at any point in the Mississippi Valley at prices which are attractive, particularly for special work requiring a fine grade of stone.

Trade Notes.

ASPHALT.

Utica, N. Y.—The directors of the Interstate Paving Company have elected of-

GABRIEL McDONALD, ST. LOUIS, MO.
St. Louis Crushed Quartz Co.

ficers as follows: President, Charles I. Williams; vice-president; M. W. Van Auken; secretary, C. W. Rice.

Washington, D. C.—The directors of the Cranford Paving Company have elected officers as follows: President and treasurer, Joseph H. Cranford; vice-president and general manager, Percy Cranford; secretary, H. S. Houghton; attorney, A A. Hoehling, jr.

Toronto, Ont.,—A petition was filed Jan. 5 to close up the affairs of the Kramen-Irwin Rock Asphalt and Cement Paving Company of Hamilton. Liabilities of $41,000 are alleged and assets $26,000.

Pittsburg, Pa.—E. M. Bigelow, director of public works, has asked for an appropriation to build a municipal asphalt repair plant. He believes that with such a plant this city can save $50,000 annually, which now goes to the asphalt companies.

New York City—The bureau of highways in its report to Borough President Ahearn suggests the establishment of a municipal asphalt plant.

BRICK.

Kansas City, Mo.—Special.—The Alphons-Custodis Chimney Construction Company of New York advises us that they have opened up an office for the sale of their chimney and vitrified paving brick at Kansas City, Mo., in the M. K. and T. Building. The Custodis Company has now a large brick plant where they manufacture 70,000 paving brick a day. M. F. Erbs is manager of the Kansas City branch.

The Standard Vitrified Brick Company, Coffeyville, Kas., has been organized.

CEMENT.

Wellston, O.—Special.—The Alma Cement Co. advises us that they will remove their general sales office on Feb. 1 from the Land Title Bldg., Philadelphia, to Wellston. All communications should be addressed to the Alma Cement Co., Wellston, O.

Analomink, Pa.—C. W. Detrick, a real estate dealer of this place, while boring a well discovered a 70-ft. vein of cement rock of high grade. He contemplates conferring with Philadelphia capitalists with a view to organizing a company and building a cement plant.

Jackson, Mich.—The stockholders of the Peninsular Portland Cement Co. elected officers and directors Jan. 17 as follows: President and general manager, W. F. Cowham, Jackson; vice-president, W. H. Niblick, Decatur, Ind.; secretary, J. W. Shove, Jackson; treasurer, N. S. Potter, Jackson; directors, W. F. Cowham, N. S. Potter, Jackson; C. A. Newcomb, jr., Detroit; M. B. Sweeting, Jackson; W. G. Anderson, Detroit; Jacob Foerster, Ypsilanti; F. E. Palmer, J. W. Shove, Jackson; D. C. Griffith, Ypsilanti; W. H. Niblick, Decatur; W. W. Hawley, Huntington, Ind.

New Castle, Pa.—The Marquis Clay & Limestone Co. of this city has absorbed the Pennsylvania Portland Cement Co., which is preparing to erect a $1,000,000 cement plant here in the spring, according to press reports. Kilns will also be erected for the manufacture of slaked lime.

Alpena, Mich.—Another cement plant will be erected here within the next year, according to press reports, near the Michigan Alkali Company quarries, a mile north of this city. The waste rock from the quarries will be utilized. A company will be organized before spring so that work can be commenced then.

Perkinsville, N. Y.—Fire destroyed the plant of the Wayland Cement Works, near here, Dec. 25, entailing a loss of $200,000.

Chanute, Kas.—The Chanute Cement &

Oil Co. has changed to the Chanute Cement & Clay Product Co., according to press reports. A large cement plant, a large clay product plant and a belt to connect the plants with various railroads will be built here.

San Antonio, Tex.—The Alamo Cement Co. has been incorporated by Dr. Fred J Kalteyes, Chas. Baumberger, F. W. Cook and others.

Calgary, N. W. T.—Sir Sanford Fleming has decided to establish an elaborate cement plant at Kananaskie Falls, according to press reports. A fine deposit of cement in unlimited quantities has been located.

CONCRETE BLOCKS.

Essex, Ia.—J. A. Johnson will manufacture cement building blocks.

Sisseton, S. D.—T. T. Stuverud, Peter Linster and Matt Collman have organized the Sisseton Pressed Stone Company and will manufacture cement blocks.

Austin, Minn.—N. W. Warren has begun selling county rights for his new hollow block machine.

Milwaukee, Wis.—The Keening Concrete Company has been incorporated by Charles H. Keening, Peter Keening and M. D. Kelley.

Tracy, Minn.—The Ideal Cement Company has been organized by Olaf Johnson, C. H. Atkinson and Ole Opherm and will manufacture concrete building blocks, sewer pipe, hitching posts and cement sidewalks.

North Branch, Ia.—A cement brick plant is proposed.

Eldon, Ia.—A stock company is being organized to install a cement brick plant.

Waupaca, Wis.—The Gimner Brick Company will be incorporated and will enlarge its brick and cement plant to provide for the manufacture of brick, cement brick, drain tile, sewer pipe, cement blocks and curbstone.

Louisville, Ky.—The National Concrete Company has been incorporated by J. B. Ohlinschlager, Webster Gazley and B. H. Herring. The company will conduct a general concrete business, including bridge abutments and foundations, concrete walls, etc.

Chippewa Falls, Wis.—J. L. Anderson will engage in the manufacture of concrete stone.

Minot, N. D.—A concrete block plant will be established here by Chas. W. Conner of Fargo.

Hector, Minn.—M. A. Cummings, E. I. and H. M. Dodge will manufacture cement blocks.

Milwaukee, Wis.—The American Cement Construction Company has been incorporated by F. D. Quinn, F. D. Weckmueller and Fred J. Rodee.

Horicon, Wis.—Louis Dewitz will remove to Hartford, Wis., next spring and will engage in laying cement walks.

Lamberton, Minn.—John Koenig and Cliff Reynolds will manufacture cement sidewalk tiles.

Appleton, Minn.—A cement brick plant will be established here soon by Joseph Shimek of Renville, Minn.

Grand Forks, N. D.—The Red River Valley Brick Corporation is having samples of clay tested for making hollow brick, and if it proves suitable modern hollow brick machinery will be installed. A. I. Hunter, president.

Vinton, Iowa—A. E. St. Clair will engage in the manufacture of concrete fence posts.

Tipton, Iowa—M. Higel and William J. Gilmore will manufacture cement blocks.

Spooner, Wis.—A plant is proposed for the manufacture of concrete blocks.

Jefferson, Wis.—Cement building blocks are to be manufactured here by J. N. Stevens and others.

Redwood Falls, Minn.—F. E. Ring of this city contemplates the manufacture of concrete blocks at some point in Texas.

Hannibal, Mo.—Z. Fielder & Son of this city contemplate establishing a branch at Keokuk, Iowa, for the manufacture of their machine for concrete blocks.

Youngstown, Ohio—The Youngstown Artificial Stone Company has been incorporated by Timothy Behan, John T. Cantwell, W. E. Luedy, A. J. Loftus, J. W. Cumisky and John F. Hynes

Bucyrus, Ohio—The Bucyrus Cement Building Block Company has been organized and will erect buildings at once and equip a plant for the manufacture of cement blocks, roofing tile, curbing and sewer pipe.

St. James, Minn.—Special.—Albert Anderson advises us that he is completing a $10,000 church which is built of concrete blocks.

Jacksonville, Fla.—The MacDonald Brick and Cement Company has been incorporated with officers as follows: President, M. C. Drew; vice president, W. P. Brubaker; secretary, A. H. West; general manager, G. W. Canfield. The company will manufacture the cement brick patented by James A. MacDonald.

PURCHASE OF MACHINERY.

Hempsted, N. Y.—Special.—C. R. Lush advises us that he is thinking of purchasing a cement block machine.

Philadelphia, Pa.—Special.—Samuel H. French & Co., York-ave., Fourth and Callowhill-sts., advises us that they have a cement customer who contemplates the purchase of a cement block machine and a cement brick machine.

Detroit, Mich.—Special.—The Cement Working Machinery Company advises us that they have received an order from J. F. Villalti, Barcelona, Spain, for some of their concrete block machinery.

Scottville, Mich.—Special.—O. S. Bolton desires to purchase a dry block machine.

Havana, Ill.—Special.—R. R. Bruning, secretary Ashurst Press Drill Company, desires to communicate with concern manufacturing machinery for making sand cement brick and concrete building blocks.

Farmersville, O.—Special.—Samuel Izor advises us that he desires to purchase cement machinery and cement tools.

Niagara Falls, N. Y.—Special.—Col. A. Dietrick, architect, is a possible purchaser of cement mixing machinery and machines and tools for stone dressing, etc.

Traer, Ia.—Special.—William Sharfenberg advises us that he is a possible purchaser of concrete mixing machines for cement posts and cement shingles.

Lyle, Minn.—Special.—A. O. Christenson advises us that he is interested in the purchase of machinery and tools from the Cement Machinery and Manufacturing Company of Burlington, Ia., and the Miracle Pressed Stone Company of Minneapolis, Minn.

Fresno, Cal.—Special.—F. Bader of the Worswick Street Paving Company is on a trip East to investigate concrete building block machinery.

Calgary, N. W. T., Canada—Special.—M. Calder, box 236, desires to purchase stone crushers, cement mixers and steam pumps.

Regina, N. W. T., Canada—Special.—J. W. S. Eddy advises us that he is a possible purchaser of cement block machines, hand concrete mixers and cement pavement apparatus.

San Francisco, Cal.—Special.—C. E. Gilman, room 1010, Mutual Bank Building, desires to purchase hoists, derricks and trenching machinery.

Lake Odessa, Mich.—Special.—The Jordan Lake Sand Company advises us that they are interested as possible purchasers of machinery and tools for making cement and sand brick building block, cement workers' tools and a concrete mixer.

Detroit, Mich.—Special.—F. B. Chapin desires to purchase machinery and tools for general building.

Muscatine, Ia.—Special.—A Kemble of the Muscatine Concrete Paving Company advises us that he desires to purchase block machines, concrete mixers and machines and tools for concrete work in general.

Leavenworth, Kas.—Special.—Jas. Stanton desires to purchase a concrete mixer and a 10-ton road roller.

Hagersville, Ont., Canada.—Special.—The Hagersville Contracting Company, Ltd., is interested as a possible purchaser in stone crushing machinery and machinery and tools for the production of artificial stone.

Cleveland, O.—Special.—A. A. Atwater, 506 Citizens' Bldg., desires to purchase cement machinery, concrete block machines, hand concrete mixers, cement sidewalk tools, etc.

Bloomfield, Ont., Canada.—Special.—Fred E. McDonald desires to purchase a concrete mixer and cement molds for making building blocks.

North Wales, Pa.—Special.—Joseph Morris, 218 S. Main-st., desires to purchase a small concrete mixer and cement users' tools.

Gulfport, Miss.—Special.—J. P. Justice contemplates the purchase of a stone crusher.

Kankakee, Ill.—Special.—Walter W. Smith, 2 S. E-ave., mgr. Kankakee Sand Stone Company, advises us that he is a possible purchaser of cement block machines.

New Athens, Ill.—Special.—We are advised by F. W. Overbeck that he is going to make hollow cement building blocks and desires to purchase the best machine and materials.

Mattoon, Ill.—Special.—Harry L. Powell is interested as a possible purchaser of a concrete mixing machine, gravel handling and conveying and plaster mixing machines.

Denver, Colo.—Special.—The Western Engineering Company, 407-8 Jackson Bldg., desires to purchase contractors' tools.

Minonk, Ill.—Special.—Chester A. Ferrell advises us that he desires to purchase machinery and tools for making concrete street paving brick and mason's tools of all descriptions.

Redfield, S. D.—Special.—The Redfield Cement Brick and Tile Mfg. Company is in the market for sand, cement and water wheel for power purposes.

York, Neb.—Special—J. E. Maxwell, 507 W. 6th-st., desires to purchase a power mixer, dynamo, power sand screen, cars and rails.

Fairmont, W. Va.—Special.—Jas. H. Leonard, mgr. Marion Silex Stone Co., advises us that he desires to purchase a hand-power mixer.

Shenandoah, Ia.—Special—T. B. Wright desires to purchase a road roller (hand-power), trench machine and second-hand transit.

Kittaning, Pa.—Special—W. E. Noble is a possible purchaser of machinery for making cement blocks and pavements, etc.

Enderlin, N. D.—Special—Chas. E. Engle advises us that he is a possible purchaser of machinery and tools for making cement building blocks and sidewalks.

Athens, Mich.—Special—A. C. Waterman advises us that he desires to purchase patents No. 734,022 for building blocks and wall construction, and 742,936 for railroad ties and molds for building blocks.

La Crosse, Wis.—This city will purchase a cement testing machine.

Washington, D. C.—Sealed bids are asked until Feb. 7 for furnishing machine tools, hand cars, leather belting, rope, canvas and rubber hose, cars and miscellaneous supplies, including coal tar, axle grease, glue, ticking, horsehair, etc., all articles to be delivered at Colon (Atlantic Port) or La Boca (Pacific Port), Isthmus of Panama, J. G. Walker, chairman, Isthmian Canal Com.

Sumter, S. C.—Special—D. G. Zeigler, arch., desires to correspond with parties who are in a position to manufacture a patented article which requires both steel and cast iron in its construction.

Atkinson, Neb.—Special—W. A. Wheeler desires to correspond with companies making machines for making hollow cement building blocks.

PURCHASE OF MATERIALS.

We have been advised during January that the following people are interested as possible purchasers in the following materials:

Cement.

Farmersville, O.—Samuel Izor, cement.

Shenandoah, Ia.—T. B. Wright, Portland cement.

Fairmount, W. Va.—Jas. H. Leonard, mgr. Marion Silex Stone Co., cement.

Redfield, S. D.—Redfield Cement, Brick & Tile Mfg. Co., cement.

Minonk, Ill.—Chester A. Farrell, materials for making concrete street paving brick.

Mattoon, Ill.—Harry L. Powell, cement.

New Athens, Ill.—F. W. Overbeck, materials for making hollow cement blocks.

Angola, Ind.—H. L. Rockwood, cement.

North Wales, Pa.—Joseph Morris, 218 S. Main-st., cement.

Hagersville, Ont., Canada—Hagersville Contracting Co., Ltd., cement.

Detroit, Minn.—F. B. Chapin, cement and blocks.

San Francisco, Cal.—C. E. Gilman, Rm. 1010 Mutual Bank Bldg., cement.

Lake Odessa, Mich.—Jordan Lake Sand Co., cement.

Calgary, N. W. T., Canada—M. Calder, Box 236, cements of all kinds.

Regina, N. W. T. Canada—J. W. S. Eddy, cement.

Niagara Falls, N. Y.—Col. L. A. Deithick, arch., cement.

New Boston, Ill—Special—Fred Schupbach advises us that he will be in the market for a carload of good Portland cement in the spring.

Miscellaneous.

San Francisco, Cal.—C. E. Gilman, Rm. 1010 Mutual Bank Budg., cast-iron pipe.

Lake Odessa, Mich.—Jordan Lake Sand Co., cream of lime.

Shenandoah, Ia.—Wm. Sharfenberg, materials for coloring cement.

Regina, N W. T., Canada—J. W. Eddy, vitrified pipe and lime.

Hagersville, Ont., Canada—Hagersville Contracting Co., Ltd., fine stone dust.

North Wales, Pa.—Joseph L. Powell, plaster materials, sand, gravel, crushed and ground stone, coloring, etc.

Denver, Colo.—Western Engineering Co., 407-8 Jackson Bldg., building materials

Farmersville, O.—Samuel Izor, lime and plaster.

LIGHTING AND POWER.

New York City—The Simons Pyrites Burner Co. has been incorporated by W. H. Mills, J. A. Rawlins of New York and W. B. Simons of Valdosta, Ga.

New York City—The Seaboard Electric Equipment Co. has been incorporated by S. B. Smith, New York; D. H. and D. G. Patton, Yonkers.

Deadwood, S. D.—The electric light companies of this city and Leadville consolidated under the name of the Consolidated Power and Light Co. of South Dakota.

Jackson, Mich.—The Commonwealth Co. which recently incorporated under the laws of Maine is a merger to include practically every electric railway and light and power company in southern and southwestern Michigan, including this city, Otsego, Plainwell, Allegan, Battle Creek and Kalamazoo.

Indianapolis, Ind.—The Indianapolis Light and Power Co. and the Marion County Hot Water Heating Co. have been consolidated and will be known as the Indianapolis Heat and Light Co.

Portland, Ind.—The Ohio & Indiana Gas Co. and the Ohio & Indiana Natural Gas and Illuminating Co. have merged under the name of the Ohio and Indiana Consolidated Natural Gas and Illuminating Co.

New electric light, power and gas companies have been incorporated as follows:

Jersey City, N. J.—United States Portable Electric Light and Power Co. Arthur D. Wright, Henry Wadlin, Benjamin C. Raymond and Newman H. Raymond.

Atlantic City, N. J.—Consumers' Gas & Fuel Co. Henry Kuehnle, L. Doughty, Edward M. Sweeney, Harry W. Lyster, John R. Quinn, Albert C. Stockton, Geo. Carmony, Max Weinmann, John Lloyd, Lewis H. Barrett, Emmanuel C. Sherer.

St. Cloud, Minn.—Public Service Co., which is a reorganization of the Light, Heat and Power Co. Geo. W. Stewart, Edward E. Clark and R. L. Gale.

Dillonvale, O.—Dillonvale Heat, Light, Power and Water Co. Wm. B. Dagger, Frank Alexander, David I. Rennecker, W. L. Cole, Ralph E. Parlett.

Middletown, N. Y.—Orange County Lighting Co.

Guthrie, Okla.—Guthrie Light and Power Co. Thos. H. Smith of Denver, U. G. Guss, Robt. Sehlberg, J. B. Cottingham, Guthrie.

Red Bud, Ill.—Red Bud Power and Light Co. A. B. Daab, L. D. Turner, jr., J. A. Hamilton of Belleville.

Batavia, N. Y.—Batavia Light and Power Co. Seth A. Warren, Geo. R. Howard, Porter Norton, Eben O. McNair of Buffalo, Barber B. Conable, Warsaw.

Rochester, N. Y.—Eastern Monroe Electric Light and Gas Co. Henry C. Brewster of Rochester, Andrew H. Bown of Penfield, Walter A. Parce of Fairport, Clarence E. Shuster of Penfield.

MISCELLANEOUS.

Gadsden, Ala.—Col. T. G. Bush and associates announce that they have organized a company for the purpose of erecting a cast-iron soil pipe plant in this city.

Galesville, Wis.—The firm of A. D. Burnett & Co., bridge builders, was dissolved Dec. 29 and the business will be continued by A. D. Burnett.

Greenfield, Ind.—The Greenfield Bridge

& Sewer Co. has been organized and will place a plant in operation at once for the repair of steel bridges and steel sewers, and the manufacture of small steel bridges. Geo. W. and Roy Crider are interested

Cleveland, O.—Special.—The C. O. Bartlett & Snow Co. advises us that they have recently made sales of their different machinery, as follows:

The Dundee Silica Sand Co., Dundee, O., elevating and conveying machinery; Leisy Brewing Co., Cleveland, O., tube barley conveyor; Pattison Supply Co., Cleveland, O., coal conveyor; T. S. Henderson & Co., St. Louis, Mo., special cable conveyor; C. L. Holck & Co., Monterey, Mexico, mining machinery; Royal Crown Lead Co., Detroit, Mich., paint machinery; Moore Bros., Cleveland, O., and New York, paint machinery; Lowe Bros., Dayton, O., paint machinery; International Harvester Co., Chicago, Ill., paint machinery; Independent Stone Co., Cleveland, O., two steam hoists and derricks; The Underwriters' Land Co., Carthage, Mo., large ore elevator; Lorain Supply Co., Lorain, O., style E rotary dryer; The Berg Co., Philadelphia, Pa., Triumph steam dryer; General Chemical Co., Cleveland, O., direct heat dryer; Ross Keller Triple Pressure Machine Co., St. Louis, Mo., direct heat rotary dryer.

Jersey City, N. J.—The Patapsco Stone Co. has been incorporated by Franklin G. Colby, Chas. Tatham, Edwin Tatham and Benjamin Tatham.

Frankfort, N. Y.—The Acme Road Machinery Co. advises us that at their annual meeting Jan. 20, directors were reelected as follows: W. A. Cook, D. B. Cook, Jas. Dempsey, James W. Jones, of Frankfort; T. C. Ingersoll, Vernon, N. Y.; P. Pollock, Troy, N. Y.; A. Schaupp, Albany. A subsequent meeting of the directors was held and officers elected as follows: President, Philander Pollock; vice-president, Alonzo Schaupp; secretary and treasurer, Jas. W. Jones; general manager, W. A. Cook; counsel, Hon. Jothan P. Allds. The business of the company for the last year has been one of the largest in its history and the outlook for the ensuing year is very promising. A large number of orders have been booked for spring delivery and the works are running on full time. C. E. Hoag, who has been with the American Road Machine Co. and the Good Roads Machinery Co., Kennett Square, Pa., for the last sixteen years, has severed his connection with these two companies and associated himself with the Acme Road Machinery Co., and will have charge of their sales department in the Hudson Valley and New York City. Chester A. Hoag, who has also been associated with the Good Roads Machinery for the last four years, has joined the traveling force of the Acme Road Machinery Co.

F. L. Smidth & Co., of New York, recently made one shipment to the Lehigh Portland Cement Co., at West Coplay, Pa., of seven carloads containing three Smidth Kominuters and four Davidsen Tubemills, to be installed in the revision of the mill "B" plant. In addition to this they have taken the order of the same company for eighteen Kominuters and Tubemills for use in the raw and clinker departments of the new mill "G" to be built in Southern Indiana. They have also contracted with the Lawrence Cement Company of Pennsylvania, to do the engineering work and supply the grinding machinery for the large extension to their plant in Siegfried, Pa.; Kominuters and Tubemills will be used for both raw and clinker grinding. Orders for Kominuters and Tubemills have been received from J. B. Speed & Co., of Louisville, Ky., for their new Portland cement plant at Speeds, Ind., the raw material and clinker grinding being done exclusively with these machines. The Elk Portland Cement and Lime Company will reconstruct their mill at Elk Rapids, Mich., using the dry process instead of the wet process as heretofore. Smidth & Co. are doing the engineering work as well as supplying some of the grinding machinery. The Alma Cement Company, of Wellston, O., have abandoned the use of rolls for the preliminary reduction of clinker and have substituted therefore Smidth Kominuters for coarse grinding.

Inventions Concerning Cement and Its Uses.

753,616. Conveyor or Chute for Infilling Material. Thomas Nicholson, Chicago, Ill.

753,922, 753,923. March 8, 1904. Fence Posts. John Scheidler, Coldwater, Mich.

754,119. Plastic Fence Post. John C. Brooks, Charleston, Ill.

754,375. Method of Making Concrete Piles. W. C. Lyon, Hyattsville, Md.

754,550. March 15, 1904. Manufacture of Artificial Stone. F. W. Dunn, Woodstock, Canada.

754,574. Fireproof Floor Construction. R. C. Kyle, Columbus, O.

754,626. Mold for Metal Concrete Construction. Carl Weber, Chicago, Ill.

754,639, 754,640. Apparatus and Method for Making Blocks for Building or Dike Purposes. John Brower, San Francisco, Cal.

754,783. Fireproof Construction. Gustav Liebau, Maurer, N. J.

755,122. March 12, 1904. Building Construction. G. F. Fisher, North Tonawanda, N. Y.

755,253. Cement Plate Press. Louis Streuli, Zurich, Switzerland.

755,336. Fireproof Building Structure. G. B. Waite, New York.

754,807. Tunnel Construction. Jesse W.

755,513. Combined Rotary Kiln and Drier. C. A. Matcham, Allentown, Pa.

755,947. March 29, 1904. Cement Furnace. Jackson Sheneman, Bronson, Mich.

756,102. Molding Machine. R. E. Davis, Hopedale, Mass.

756,295. April 5, 1904. Artificial Stone. Virge Steger, Bonham, Tex.

756,300. Ventilating Building Block. R. L. Underwood, Fostoria, O.

756,309. Reinforced Beams, Etc., and Grillage Therefor. W. N. Wight, New York City.

756,471. Construction of Joists, Girders or the Like. James D. Carey, Cleveland, Ohio.

756,629. Device for Erecting Buildings Out of Plastic Material. William Harrison, Grand Rapids, Mich.

756,798. Process of Making Paving Brick. T. S. Pierce, Detroit, Mich

756,805. Removable Pile for Forming Concrete Piling. Frank Sherman, Philadelphia, Pa.

756,814, 756,815, 756,816, 756,817. April 12, 1904. Railway Construction. (Concrete steel ties.) Louis Beezer and Michael J. Beezer, Pittsburg, Pa.

757,033. Building Block. R. T. Frost, Dows, Iowa.

757,035. Apparatus for the Manufacture of Slag Cement. Carl Gramm, Frankfort-on-the-Main, Germany.

757,093. Cement Mold. R. B. Coltrin, Jackson, Mich.

757,094. Cement Molding Apparatus. R. B. Coltrin, Jackson, Mich.

757,483. April 19, 1904. Process of Manufacturing Stone. Jacob C. McClenahan, Wilmington, Del.

757,522. Cement Kiln Cleaning Machine. C. J. Van Doren, Iola, Kan.

757,552, 757,553. Arch Bridge Construction. S. W. Hill, Ross tp., Allegheny, Co., Pa.

757,767. Sectional Core for Making Concrete Piles. G. H. Poor, Chicago, Ill.

757,962. Fence Post. V. E. Randall, Burlington, Mich.

758,061. April 26, 1904. Bar for Strengthening Cement Floors on Concrete. J. F. Golding, New York City.

758,184. Sidewalk. E. A. Langenbach, Canton, O.

758,500. Building Construction. G. A. Behrend, San Francisco, Cal.

758,577. Floor or Ceiling. W. N. Wight, New York City.

758,591. Fence Post. J. B. Goundry, Belleville, Mich.

758,612, 758,613. May 3, 1904. Concrete Railway Ties. M. J. Beezer and Louis Beezer, Pittsburg, Pa.

758,681. Hopper. Noyes F. Palmer, New York, N. Y.

758,707. Cement Post. F. A. Sicklesteel and Charles W. Ballard, North Branch, Mich.

758,728. Floor and Process of Building Same. W. N. Wight and F. E. Townsend, New York, N. Y

758,778. Fence Post. J. P. Plattenberger, Savanna, Ill.

758,900. Railway Tie. F. A. Delano, Chicago, and C. H. Cartlidge, Lagrange, Ill.

758,972. Machine for Molding Plastic Material. M. Kammerer, Fairbury, Ill.

759,010. Hollow Building Block. H. S. Palmer, Washington, D. C.

759,031. Mold for Concrete Walls. Charles E. Shumway, Albion, Mich.

759,109. Railway Tie. F. M. Hiett, Red Oak, Iowa.

759,204. Machine for Packing Flour into Barrels or Sacks. L. Van Nette, Bradford, Pa.

759,344. May 10, 1904. Fence Post. M. T. Carolan, Cass City, Mich.

759,356, 759,357. Method and Apparatus for Burning Portland Cement Clinker. Thos. A. Edison, Llewellyn Park, N. J.

759,373. Mold for the Manufacture of Artificial Stone. C. H. Hutchings, Toronto, Can.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

CONTEMPLATED WORK.

Fremont, O.—Paving is proposed for Arch-st. next summer.

Mt. Pleasant, Wis.—Macadamizing is contemplated for 14 miles of roads.

Rochester, Minn.—The property owners on Zumbro-st. are in favor of paving.

Poplarville, Miss.—City voted to issue bonds for road work. Address mayor.

Elyria, O.—Repaving is contemplated for Middle-ave. Frank R. Rouver, city clerk.

Lincoln, Neb.—City council has passed resolutions for paving G, 16th, L, and M-sts.

Syracuse, N. Y.—Council has decided to pave Wood and Wilbur-aves. with brick or asphalt.

Freeport, Ill.—Resolutions have been passed for paving Liberty-st. G. W. Graham, city engineer.

Easton, Pa.—In his annual message Mayor Lehr recommends the extension of the paved streets.

Long Beach, Cal.—The City Trustees contemplate paving Second street from

American to Magnolia avenues with asphalt.

Chillicothe, Ohio—Plans and estimates are being made for paving several streets. H. M. Redd, City Engineer.

Erie, Pa.—An ordinance has been passed for grading, paving and curbing Fourteenth street from Ash to Wayne streets.

Nashua, N. H.—City Engineer Johnson has prepared estimates for paving Main street with bitulithic pavement.

Braidentown, Fla.—This county has decided favorably on issuing $200,000 road improvement bonds. County Clerk.

Bessemer, Ala.—City Council has decided to improve a large list of streets with chert and curbing. Mayor Huey.

Stevens Point, Wis.—Council has passed an ordinance for paving Strong avenue and Main street with macadam or brick.

Meadville, Pa.—An ordinance has been passed for about 3,000 feet of paving on Park avenue. W. A. Doane, City Engineer.

Kingston, N. Y.—A contract will be let soon for 10,000 square yards of street paving. L. J. Mewborne, Town Clerk.

Bay City, Mich.—City Engineer Turner is surveying Columbus-ave. preparatory to securing estimates for brick paving.

Baton, Rouge, La.—This city contemplates about 5,000 square yards of bitulithic or asphalt paving. R. Swart, City Engineer.

Freeman, N. Y.—Mayor Block recommends, in his annual message, the paving of Broadway, at a cost of about $97,000.

Des Moines, Iowa—The property owners of Walnut-st., from the river to W. Ninth-st., have petitioned for asphalt paving.

Cleveland, Ohio—The county commissioners are considering the widening of the Lake road to 80 feet and macadamizing the same.

Camden, N. J.—An ordinance has been passed for paving Seventh-st., from Vine to York with asphalt. H. C. Kramer, City Clerk.

Grand Rapids, Mich.—The property owners on Scribner-st. are divided between brick and asphalt blocks for paving that street.

Averyville, Ill.—The estimated cost of excavating, graveling, constructing cement walks and curbing on Madison-ave. is $22,500.

Cortland, N. Y.—Resolutions have been passed and bids will be asked for macadamizing Tompkins-st. from York-st. to the city line.

Jersey City, N. J.—Plans and specifications have been prepared and bids will be asked soon for improving Carlton and Mallory-aves.

Chelsea, Mass.—In his annual report Mayor Willard recommends an expenditure of $40,000 for street improvements. A. C. Maggi, city manager.

Tacoma, Wash.—City council streets and alleys commission decided, Jan. 7, to recommend asphalt paving for M-st. from Division-ave. to N. Sixth-st.

Ft. Wayne, Ind.—Plans and specifications have been completed by city manager Randall for 25,842 feet of paving, at a cost of $225,000 for this year.

Nashville, Tenn.—City council passed a resolution to petition the Legislature for authority to issue $500,000 street bonds. W. W. Southgate, city manager.

Petaluma, Cal.—Special—N. S. Frost, city engineer, says he has prepared plans and estimates for grading, curbing and macadamizing a portion of Keokuk-st.

New Orleans, La.—A petition is being circulated in the Thirteen ward requesting city council to pave Valence-st. from the river to Dryades-st. with asphalt.

San Francisco, Cal.—The city engineer was directed, Jan. 18, to prepare new specifications for paving Mission-st. from Onondaga-ave. to the county line.

Menominee, Mich.—Council is considering the question of paving Wilson-ave with macadam, with brick gutters, and three blocks of Broadway with brick on concrete base.

Laporte, Ind.—This city contemplates paving two blocks of Washington-st. with brick and six blocks of other streets with macadam in the spring. C. H. Martin, cy. engr.

Albany, N. Y.—The Board of Contract and Supply rejected bids Jan. 14 for paving S. Pearl-st. with asphalt blocks, for technical reasons, and will readvertise for bids.

Chattanooga, Tenn.—In a message to the General Council Jan. 16 Mayor A. W. Chambliss recommended a bond issue of $125,000 for permanent street and sewer improvements.

Terre Haute, Ind.—City Engineer Kidder has been directed to prepare plans and specifications for paving Wabash-ave., from Thirteenth to Nineteenth-sts., with brick, with curbing and concrete walks.

Lawrence, Kas.—City Council has directed that an ordinance be prepared providing for macadamizing the driveways in Oak Hill Cemetery. F. D. Brooks, cy. clk.; B. J. Dalton, cy. engr.

Superior, Wis.—A resolution was introduced Jan. 17 providing for the paving of Broadway-st., from Oakes to Hammond-aves., with asphalt, tar macadam, brick and creosoted blocks.

Augusta, Ga.—About 10,000 square yards of brick paving will be constructed on Eighth-st., from Broad to Walker-sts., as soon as the weather will permit. Nisbet Wingfield, cy. engr.

Calumet, Mich.—This city will expend about $100,000 on street improvements during the next summer, including the replacing of wooden sidewalks with cement and paving the streets.

Ballard, Wash.—City Council directed the city attorney, Jan. 17, to prepare an ordinance for grubbing, grading and constructing cement sidewalks on Post-st., from Sixth to Tenth-aves.

Escanaba, Mich.—Council contemplates asking for bids for paving Ludington-st. with other materials than brick, if it be

legally done under the resolution providing for the work.

Ashland, Ky.—Special.—Charles D. Boggess, cy. engr., says that a contract will be let in March for 50,000 sq. yds. of brick paving on concrete base and for 5½ mis. of concrete curb and gutter

Baltimore, Md.—An ordinance has been approved appropriating $15,800 for paving Calvert-st., from Fayette to Lexington, with wooden blocks, and Lexington-st., from Charles to Calvert, with vitrified brick.

Petersburg, Va.—A bill has been introduced in the Legislature providing an appropriation of $60,000 to macadamize the road leading from this city to National Cemetery, a distance of three miles. Robt. Budd, cy. engr.

DeKalb, Ill.—Special.—A. R. Russell, cy. engr., says this city will be ready in February to receive bids for street paving requiring about 10,000 lin. ft. of concrete curb and gutter and 13,000 sq. yds. of brick paving.

South Omaha, Neb.—Missouri-ave. and Q-st., from Thirty-third to Thirty-ninth-sts., are to be graded and paved. Petitions are being circulated for the improvement of a number of other streets, and the construction of permanent sidewalks will continue on all streets as they are graded or paved.

South McAlester, I. T.—The property-owners in South McAlester will petition the City Council to enact an ordinance creating an improvement district in the business section of the city. Plans have been prepared for paving four streets with vitrified brick and the work will begin as soon as it can after the passage of the ordinance.

CONTRACTS TO BE LET.

Marion, Ind.—Bids are asked until Feb. 6 for constructing Cemetery Boulevard. County Auditor.

Lorain, O.—Bids are asked until Feb. 4 for grading and draining Duane-st. J. J. Mahoney, City Clerk.

Madison, Wis.—Bids are asked until Feb. 15 for macadamizing various streets. J. F. Icks, City Engineer.

Seattle, Wash.—Bids are asked until Feb. 4 for planking several streets. R. H. Thompson, City Engineer.

Rensselaer, Ind.—Bids are asked until Feb. 7 for constructing gravel roads. Jas. N. Leatherman, County Auditor.

Grass Valley, Cal.—Bids are asked until March 1 for constructing a road. F. L. Ambogast, Clerk Board of Supervisors.

Washington, D. C.—Bids are asked until Feb. 18 for grading 14th-st. extended. H. B. F. MacFarland, Chairman District Commissioners.

Leesville, La.—Bids are asked until Feb. 15 for grading 30 mis. of public road. J. J. Cryer, prest. police jury.

Napa, Cal.—Bids are asked until Feb. 14 for constructing a road in dist. No. 11. N. W. Collins, clk. bd. trustees.

Quarryville, Pa.—Bids are asked until Feb. 13 for constructing a macadamized road from this place through East Drumore twp.

Topeka, Kas.—Bids are asked until Feb. 6 for grading, curbing and paving with brick a number of streets. J. H. Squires, cy. clk.

Peru, Ind.—Sealed bids are asked until Feb 23 for constructing free gravel roads in Harrison twp. Clarkson W. Macy, co. audt.

Broad Ripple, Ind.—Bids are asked until Feb. 7 for building cement sidewalks on Shelby, Hancock and North-sts. John O. Brenneman, clk.

Cleveland, O.—Sealed bids are asked until Feb. 8 for grading, draining, curbing and paving 36 streets with brick. A. B. Callow, clk. B. P. S.

Vincennes, Ind.—Sealed bids are asked until Feb. 7 for constructing 31 mis. and 4,173 ft. of gravel roads in Johnson twp. J. T. Scott, co. audt.

Sharon, Conn.—Bids are asked until Feb. 4 for grading 1 section and graveling another section of road. Jas. B. Wilbur, chmn. town bd. selectment.

Fresno, Cal.—Sealed bids were asked until 5 p. m., Feb. 4, for constructing an artificial sidewalk on 1 st. from Kern to Inyo sts. C. H. Sayre, cy. clk.

Indianapolis, Ind.—Sealed bids are asked until Feb. 10 for constructing a boulevard from Capitol ave. to Central ave. Hiram Brown, chmn. bd. park cmrs.

Port Townsend, Wash.—Bids are asked until Feb. 9 for constructing cement walks and approaches to buildings at Forts Worden and Casey. G. H. Penrose, Q. M.

Bay City, Mich.—Sealed bids are asked until Feb. 4 for supplying the Bay Road commission with crushed stone and gravel during 1905. Warren D. Richardson, secy. cmn.

Astoria, Ore.—Sealed bids are asked until Feb. 6 for grading and constructing plank roads and sidewalks about the new public buildings at Fort Stevens. Capt. Goodale, Q. M.

Petaluma, Cal.—Special.—N. S. Frost, cy. engr., says that bids will be received until Feb. 6 and 20 respectively for grading, curbing and macadamizing Kentucky and Brown sts.

Jacksonville, Fla.—Sealed bids are asked until Feb. 13 for 37,800 sq. yds. of vitrified brick or block paving, 21,100 lin. ft. of stone curbing, and 74 circular corner stones. Philip Prioleau, cy. engr.

Albany, N. Y.—Sealed bids are asked until Feb. 6 for paving S. Pearl st., from State to Gansevoort, with asphalt blocks, repairing sidewalks and building receiving basins. Isidore Wachsman, clk. bd. cont.

Webb City, Mo.—Sealed bids are asked until Feb. 6 for paving with vitrified brick Allen st., 8,306 sq. yds.; Daugherty st., 4,042 sq. yds.; Main st., 3,422 sq. yds.; Webb st., 1,749 sq. yds; Church st., 755 sq. yds. W. E. Smith, cy. engr.

CONTRACTS AWARDED.

Toledo, O.—Kerlin Bros. secured the contract for paving Thirteenth-st. for $6,291.

Louisville, Ky.—L. R. Figg was awarded the contract for paving a large number of streets.

Houston, Tex.—The contract for paving Sampson-st. was awarded to Sunderman, Delson & Co. for $5,778.

Oakland, Cal.—The Blake & Bilger Company was awarded the contract for building cement sidewalks on Sixth-st.

Michigan City, Ind.—The contract for mcadamizing Roecke Road was awarded to J. C. Wilhelm for $10,475.

Boone, Ia.—The contract for constructing 2,000 feet of brick sidewalks was awarded to the Boone Brick, Tile and Paving Company.

Montgomery, Ala.—The contract for paving S. Hull, Mildren and Monroe-sts. and Madison-ave. was awarded to Byron-Suders & Co. of Atlanta, Ga.

Boston, Mass.—The contract for constructing 5,800 feet of state highway in Rutland was awarded to Bruna & Milano, 293 North-st., Boston, for $6,367.

Harrisburg, Pa.—The contract for constructing 1,700 ft. of state road in Chester County was awarded to Thos. E. O'Connell of West Chester for $3,014.

Tacoma, Wash.—W. J. Murphy was awarded the contract for building cement and wooden sidewalks, crosswalks and storm water drains in dist. No. 217 for $10,772.

Peoria, Ill.—Dunbar & McAllister of this city secured the contract for paving Glen Oak-ave. with brick at $1.35 a sq. yd. and 40 cts a lin. ft. for concrete curb.

Tom's River, N. J.—Lewis Rafeto, Drexel Bldg., Philadelphia, was awarded the contract for constructing about 23,755 ft. of gravel road in Lacy twp. for $17,132.

Rochester, N. Y.—The Rochester Vulcanite Pavement Company submitted the lowest bid, Jan. 18, for asphalt repairs and will probably be awarded the contract at $1.28 a sq. yd.

London, Ont., Canada—The contract for 11,722 sq. yds. of brick paving on 5-in. concrete base was awarded to John Geary of this city for $25,689. Logan brick will be used.

Orrville, O.—The contract for paving W. Market-st. was awarded to H. B. Shannon of this city for $22,372. Metropolitan brick, Berea curbing, slag foundation and cement filler will be used.

Xenia, O.—Keap & Sons of Middletown have been awarded the contract for about 25,650 sq. yds. of brick paving on Main-st. at $1.38 a sq. yd. outside of street car tracks, and $1.50 between the tracks; total, $38,346.

Philadelphia, Pa.—Michael O'Rourke was awarded the contract Jan. 11 for repairs to the paved streets in the entire city during 1906 for $127,000. E. H. Vare secured the contract for repairs to the country roads for $120,000.

Oklahoma City, Ok.—Paving contracts were awarded Jan. 8 as follows: Third-st., from Broadway to Stiles, asphalt, Cleveland Trinidad Asphalt Paving Company, Cleveland, O.; Reno-ave., Santa Fe to Walnut, brick, Fuller & Hipple; E. Main-st., E. Grand and Oklahoma-aves., from Main-st. to Reno-ave., brick, Likes Improvement Company.

Los Angeles, Cal.—Street improvement contracts have been awarded as follows: Grading and graveling Soto-st., from Sheridan to Fairmount-sts., Chas. Stansbury, $2.23 a lin. ft.; curbing, 30 cts.; gutter, 7 cts.; sidewalks, 20 cts, a sq. ft. Ord-st., from Buena Vista to Castelar-st., H. J. McGuire, grading and graveling, $1 a lin. ft.; curb, 30 cts.; sidewalks, 10 cts. a sq. ft. Avenue Thirty-seven, from Pasadena-ave. to Carlota Boulevard, Geo. Rheinschild, grading and graveling, $1.25 a lin. ft.; curb, 30 cts.; sidewalks, 10 cts. a sq. ft.

Atlantic City, N. J.—Bids were submitted Jan. 17 for paving Atlantic-ave. with asphalt and bitulithic. The Cleveland Trinidad Paving Company was the lowest bidder on asphalt and the Standard Bitulithic was the lowest on bitulithic. The Barber Asphalt Paving Company submitted the lowest bid for bitulithic, but its bid was rejected because it was not in accordance with the specifications. The McGovern Construction Company of Trenton was the lowest bidder on both concrete and granite curbing. Action on the bids was deferred until Jan. 25.

Newark, N. J.—Contracts for Telford paving on country roads have been awarded as follows: Pier Lane, in Caldwell, Francisco Bros., of Little Falls; Franklin-ave., in Nutley, Wright & Lindsley, of Orange; Bradford-ave., in Montclair and Verona, Osborne & Marsellis Company, of Montclair; Wall-st. and Stuyvesant-ave., in Vailsburg and Irvington, Ludwig & Batt, of South Orange; South Orange-ave. extension, in Livingston, Wright & Lindsley; road to Northfield, in Livingston, Wright & Lindsley; Mt. Pleasant-ave., in West Orange, Denato Fusco.

SEWERS.

Johnson City, Tenn.—The Johnson City Sewerage Company has been incorporated by William Ponder, L. C. Williams, P. M. Ward, G. T. Wofford and J. A. Ponder.

CONTRACTS AWARDED.

Newton, N. J.—A sewerage system is contemplated.

Eugene, Ore.—Bonds will be issued for constructing new sewers.

Caldwell, N. J.—A sewerage system may be constructed this year.

Asbury Park, N. J.—Plans are being prepared for a septic sewer system.

Perry, Ia.—Plans for a sewerage system are being made by M. A. Earl, of Chicago.

Mt. Carmel, Pa.—A $100,000 bond issue is recommended for the extension and

completion of the present sewerage system.

North Platte, Wis.—This city voted to issue $30,000 bonds for building new sewers.

Lake Preston, S. D.—The question of constructing a sewerage system is being considered.

Gulfport, Miss.—A better sewerage system is favored by Mayor Moore. Frank Martin, city clerk.

Elgin, Ill.—Petitions will be circulated for the construction of a sewer on Dundee-ave.

Fitchburg, Mass.—A trunk sewer and sewage disposal system is contemplated. H. O. Sawyer, mayor.

South St. Joseph, Mo.—Plans are being made for constructing a main sewer at a cost of $75,000.

Kirkwood, Mo.—This town is considering the question of sewage disposal. Charles G. Recker, mayor.

Dillon, S. C.—Plans for a sewerage system will be prepared by Frederick Minshall, of Abbeville, S. C.

Camden, N. J.—City council has passed ordinances for constructing twenty-two sewers. H. C. Kramer, city clerk.

Macon, Ga.—A sewerage system is contemplated for Vineville and Huguenin Heights. J. W. Wilcox, city engineer.

Waterloo, N. Y.—The question of appropriating $800 for a preliminary sewer survey will be voted on.

Butler, Pa.—The question of issuing $65,000 bonds for enlarging the sewers and paving will be voted on.

Baton Rouge, La.—This city contemplates the construction of about 5 miles of sewers. R. Swart, cy, engr.

Chillicothe, O.—Contracts will be let soon for 6,800 ft. of 12, 10 and 8-in. pipe sewers. H. M. Redd, cy engr.

Bluffton, O.—The State board of health has approved plans for sewerage and sewage disposal for this place.

Boston, Mass.—An order has been passed authorizing an expenditure of $800,000 for the construction of new sewers.

North Yakima, Wash.—The question of extending the sewerage system will be voted on this spring. J. C. Brocker, cy. clk.

Salem, Mass.—The sewerage commission will ask for plans for the completion of the trunk sewerage system. J. Loring. Bowen, clk.

Washington, Ia.—Plans and specifications for a system of sanitary sewers are being prepared by C. Qimball of Davenport.

Waterloo, N. Y.—The question of issuing bonds for constructing a sewerage and water works system will be voted on Feb. 8.

Des Moines, Ia.—Plans have been filed for a 42-in. brick sewer from 21st and High sts., through the west end of Des Moines.

Webster, Mass.—Plans will be prepared for building an outfall sewer that will empty into the Maanexit River near Dudley. Chas. Haggerty, Sewer Commissioner.

Waterbury, Conn.—Contracts will probably be let next spring for constructing a sewage disposal plant. R. A. Cairns, cy. engr.

West Seneca, N. Y.—The town board authorized, Jan. 19, the construction of a sewerage system and calling for bids for same.

Dekalb, Ill.—Special.—A. R. Russell, cy. engr., says this city is in the market for a pump suitable for emptying the septic tank.

Paw Paw, Mich.—Plans have been made for the construction of sewers and the work will begin in the spring, according to press reports.

Abilene, Kas.—City Council has adopted an order providing for a new sewer district in North Abilene, to be known as sewer dist. No. 3.

Quincy, Mass.—The question of a $200,000 sewer loan is being considered by the joint committee of council. E. W. Branch, engr. sewer bd.

Houston, Tex.—The bids submitted for the construction of a 4-ft. metal concrete sewer 400 ft. long were rejected and new bids will be asked.

Lorain, O.—City Council has authorized the construction of a storm water sewer between Woodland-ave. and Black River at a cost of $45,000.

Huntington, Ind.—Brick and cement is proposed for the construction of the Rabbit Run sewer, according to press reports. H. H. Wagoner, cy, engr.

Sebastopol, Cal.—Special—Plans and specifications for a sewerage system for this town are being made by N. S. Frost, City Engineer of Petaluma.

Lexington, Ky.—Plans and specifications have been prepared for constructing three main trunk sewers. The sewers will be of brick laid in concrete.

Ballston Spa., N. Y.—Plans have been completed and submitted to the State Board of Health for approval for the proposed sewerage system for this city.

Bridgeport, Conn.—The sewer committee estimates the cost of new sewers and extensions and repairs to present ones at $22,300. E. T. Buckingham, City Clerk.

Binghamton, N. Y.—A plan for placing a filtering plant for a sewerage system in the western part of the city is being considered by S. M. Baird, City Engineer.

Auburn, N. Y.—Plans are being prepared for sewers and a sewage purification plant for 4th, 5th, 6th and 7th wards by Geo. S. Pierson of Kalamazoo, Mich.

Mt. Vernon, Ill.—Special—Plans for a complete sanitary sewerage system and a septic tank for this city have been completed by the Iowa Engineering Co. of Clinton, Ia.

Northampton, Mass.—In his inaugural address, Theobald M. Connor, Mayor, advocates the construction of a new sewerage system, for which four plans are under consideration.

Barberton, O.—The estimated cost of reconstructing the main sewer in sanitary sewer district No. 1 is $5,500. Engineer Collins recommends concrete brick for its construction.

Altoona, Pa.—Plans are being prepared for a sewerage system for the borough of Millville, lying west of the Ninth ward of this city, which has been annexed to the city. Harvey Linton, city engineer.

South Omaha, Neb.—Plans for the revision and extension of the entire sewerage system during next summer will be prepared by Andrew Rosewater, city engineer of Omaha, John J. Gillin, city clerk.

Mankato, Minn.—The citizens in the First ward voted Jan. 19 to have a committee appointed to secure the extension of sewer and water mains to the Franklin school and to the Tourtellotte Hospital.

Petaluma, Cal.—Special—N. S. Frost, city engineer, says he has prepared plans and estimates for constructing sewers on Edith and Adams-sts., and has been directed to prepare plans for a number of other sewers.

Grand Rapids, Mich.—A resolution was adopted Jan. 9 to improve the west side ditch with a trunk sewer, pumping station and flood prevention embankment, etc., at a cost of $203,960. W. L. Anderson, city engineer.

Oxnard, Cal.—The city trustees will decide soon whether a system of septic tanks or an outfall sewer to the ocean will be most expedient. County surveyor Ward will begin at once on making surveys and plans.

Chilicothe, O.—The State Board of Health has approved plans for a sewer in Main and Poplar-sts., emptying into the Scioto, on condition that a purification system shall be installed when the board deems it necessary.

Little Falls, N. Y.—In his annual message to council Mayor Edward H. Douglas recommends that steps be taken toward constructiing a separate system of storm sewers, paving the streets in the business section with brick, building macadam streets, and the purchase of a stone crusher.

Kansas City, Mo.—Plans have been prepared for the enlargement and extension of the sewerage system. The plans provide for carrying drainage of Turkey Creek and O. K. Creek valleys through the West Bottoms to Missouri River, at a cost of $850,000; other incidental improvements in this watershed, $250,000; drainage of Brush Creek Valley, including $117,000 for Harris branch, $263,000; Gooseneck Creek watershed, $69,123, and drainage of Blue River Valley from Brush Creek to the Missouri, $52,577; total, $1,484,690.

CONTRACTS TO BE LET.

Lawrence, Kas.—Bids are asked until Feb. 6 for 730 feet of 8-inch lateral sewer. F. D. Brooks, City Clerk.

Topeka, Kas.—Sealed bids are asked until Feb. 6 for constructing a system of sewers in District No. 26. J. H. Squires, City Clerk.

Bogota, N. J.—Bids are asked until Feb. 14 for constructing 6,445 feet of 8 to 24-inch pipe sewers and 23 manholes, from the Hackensack river to the River road. Peter F. Hopper, Chairman Road Committee.

Havana, Ill.—Bids are asked until Feb. 15 for 1,616 feet of 42-inch brick sewer, of which 800 feet is tunnel work, 495 feet 24x36-inch brick sewer and 400 feet tile sewer. J. J. Donaldson, Chairman.

Pana, Ill.—Bids are asked until Feb. 11 for furnishing and laying 5,000 feet of 15-inch, 5,700 feet 14-inch, 8,700 feet 12-inch and 3,900 feet 10-inch tile in the Pana and Assumption district. A. B. Alexander, Engineer, Decatur, Ill.

St. Bernard, O.—Bids are asked until Feb. 3 for constructing sewers in Leonard-ave., Albert and Bertus-sts. Bids are asked until Feb. 16 for constructing sewers in Ross, Tower, Cleveland, McClelland and Beecher-aves. Geo. Meyer, Village Clerk.

Lebanon, Ind.—Sealed bids are asked until Feb. 13 for constructing a storm sewer in the 3rd ward, requiring 677 feet of 15-inch sewer pipe, 48 feet 18-inch iron pipe, 1,928 feet of 18-inch sewer pipe, with manholes, bulkheads, etc. Edmund Connor, City Clerk.

New Rochelle, N. Y.—Bids are asked until Feb. 23 for constructing 1,875 feet of 30-inch submerged c. i. pipe sewer under arm of Echo Bay, including construction of sand catcher, rising well and other appurtenances. Jas. Knapp Wilkes, Engineer; Geo. W. Sutton, Chairman of Board Sewer Commissioners.

Columbus, O.—Sealed bids are asked until Feb. 11 for improving the northern division of the Ohio and Erie Canal, requiring 5,000 barrels of Portland cement, 42 cots of lock gates, 500 feet 30-inch sewer pipe, 3 steel or combination aqueducts, 1 portable traction engine, protection and rip-rap stone concrete work for lock walls, culverts and other structures, etc. Chas. E. Perkins, Chairman Engineer Public Works of Ohio.

CONTRACTS AWARDED.

Jefferson City, Mo.—Gruber & Vetter secured the contract for constructing sewers in sewer district No. 11,, Jan. 4, for $8,364.

Beaumont, Tex.—The contract for constructing sewer extensions on Park, Emmett and College-sts was awarded to Callahan & Graham.

North Braddock, Pa.—The contract for constructing pipe sewers in various streets was awarded to John S. Sheeky of Rankin, Pa., for $6,294.

Toledo, O.—The lowest bid submitted Jan. 12 for a big sewer in southeast Toledo was that of O'Neill & Tansey, who offered to do the work for $104,015.04.

Terre Haute, Ind.—Contracts were awarded Jan. 9 for sewer construction as follows: S. First and S. Third-sts., Rob-

erts & Co.; N. Seventh-st., Jesse Robertson; total cost, $9,500.

Davenport, Ia.—The People's Construction Company was awarded a contract Jan. 2 for 10,000 feet of 36-inch vitrified block sewer, 7,600 feet 30-inch vitrified block sewer and forty manholes, for $67,408.

East Liverpool, O.—The contract for furnishing 1,200 car loads of sewer pipe, to be used for drainage purposes along the proposed route of the Panama Canal, has been awarded to the American Sewer Pipe Company of this city.

Mamaroneck, N. Y.—Contracts for constructing sewers were awarded Jan. 2 as follows: A. S. Traub, 215 W. Main-st., New York City—Boston Post Road, sec. 1, $3,411; Winfield-ave., sec. 1, $70. Hawman Bros., Reading, Pa.—Boston Post Road, sec. 2, $4,762; Mamaroneck-ave., sec. 1, $3,432.

New Albany, Ind.—The contract for constructing a sewerage system has been awarded to P. G. McNerney & Co. of Brownstown, Ind., for $207,310. Mayor Grose withholds his approval of the contract, however, claiming that the construction of the system will work hardships on the property-owners. Press reports state that the city council threatens to institute mandamus proceedings. City Attorney Jewett may accept the contractor's bond for the work.

WATER-WORKS.

Independence, Kas.—Judge Pollock of the federal court granted a temporary restraining order preventing this city from issuing bonds or proceeding with the building of municipal water works.

Chicago, Ill.—Judge Kohlsaat of the United States court has entered an injunction restraining the city officials from laying mains or supply pipes in Austin so that the city can furnish water to the citizens of that village.

Hammond, Ind.—John O. Bowers of this city was appointed receiver for the Lake City Water Co. Jan. 26 by Judge Anderson of the federal court. The constitutionality of the contract between the city and the water company will be tested at the final hearing in federal court in February.

Knoxville, Tenn.—Judge C. D. Clark of the federal court has decided that the rates on water fixed by the Birdsong ordinance can not prevail. This ordinance provides for a reduction of the price of water about one-third. The bill of the Knoxville Water Co. to enjoin the enforcement of the ordinance and setting up that the rates as provided are unreasonably low was filed in December, 1901.

CONTEMPLATED WORK.

Glens Falls, N. Y.—This village will adopt a general meter system.

St. Cloud, Minn.—Council will investigate sand filtration systems.

Morristown, Ind.—Town trustees contemplate installing a water works plant.

Quincy, Mass.—Council contemplates expending $30,000 for water main extensions.

Athol, Mass.—This town has applied to Legislature for authority to build water works.

Pana, Ill.—City council has decided to extend the water mains north to the city limits.

Holyoke, Mass.—The water board is considering the installation of a water meter system.

Elmwood Place, O.—Council water committee is considering the installation of water meters.

Columbus, Ind.—The question of securing a pure water supply for this city is being considered.

Agawam, Mass.—This town has asked Legislature for permission to construct a water works system.

Niagara Falls, Ont.—Special—John H. Jackson is a possible purchaser of a water works pump and standpipe.

Newark, N. J.—This city voted to purchase the plant of the Newark Water Company and will expend $15,000 in improving it.

Fostoria, Ohio—The improvement of the water supply by connecting with Portage creek and establishing a filter bed is proposed.

Brighton, Vt.—The question of constructing new or purchasing the water works system is being considered. M. B. Ladd, First Selectman.

Rochester, N. Y.—The Rochester & Lake Ontario Water Co. contemplates building two more pumping stations and laying two more pipe lines soon.

Birmingham, Ala.—The Commercial Club has inaugurated a movement for securing a larger water supply for manufacturing and commercial purposes.

Brockton, Mass.—The water commissioners contemplate laying from 12,000 to 15,000 feet of 6-inch and 2,000 to 3,000 feet of 8 and 10-inch water pipe this year.

Newark, N. J.—The board of works has decided to add to the Pequannock water shed a tract of land comprising 129 acres near Canistear reservoir.

Lockport, N. Y.—This city voted to issue bonds not to exceed $300,000 to supply this city with water by means of a canal from the Niagara river.

Chattanooga, Tenn.—A bill has been introduced in the Legislature authorizing this city to issue $700,000 bonds to purchase the plant of the City Water Co.

Alpena, Mich.—This city will vote March 14 on the issue of $150,000 bonds for the purchase aor construction of a water works system. F. C. Holmes, Mayor.

Sebastopol, Cal.—Special—Plans and estimates for a water works and sewerage system for this place are being made by N. S. Frost, City Engineer of Petaluma.

Rushville, Ind.—City Council has directed that the municipal water works plant be strengthened and that new wells be driven for increasing the water supply.

Ft. Worth, Tex.—The City Council of North Ft. Worth has deferred the adoption of plans for the proposed new water works plant. The plans are about completed.

Garfield, N. J.—Borough Council has appointed a committee to have the present water works plant appraised, preliminary to the borough purchase of it, or building a new plant.

The question of issuing bonds for constructing water works will be voted on at the following places: Exeter, Neb., Feb. 14; Waterloo, N. Y., Feb. 8; Lindsborg, Kan., Feb. 14; Ft. Voller, Tenn., Feb. 24.

The question of issuing water works bonds has been favorably voted on as follows: Montrose, Colo.; Poplarville, Miss.; Glendive, Mont.; North Platte, Neb.; Cassville, Mo.; Thief River Falls, Minn.; Depere, Wis.

New York City—The board of estimates and apportionment is considering plans which provide for the construction of a tunnel to the Esopus River, capable of bringing 400,000,000 gallons of water to this city daily.

Monroe, Wis.—Common Council accepted and adopted Jan. 17 the report of the special water works committee, appointed to investigate and consider the question of municipal ownership of the water works system of that city.

Boise, Idaho—This city will vote Feb. 11 on a proposition to issue $500,000 bonds for the purchase of the cold water system of the Artesian Hot and Cold Water Co. and the Walling canal. The water system will be improved, extended and enlarged.

Connellsville, Pa.—Special—The selection of Indian Creek Valley, seven miles southeast of this city, as a site for the new reservoir for the Mountain Water Supply Co., is regarded as ideal. The site is a natural basin, lying between two Western ridges of the Allegheny mountains.

The construction of water works systems is contemplated at the following places: Strathcona, N. W. T.; Fort Erie, Ont.; Battle Lake, Minn.; Hastings, Minn.; Manning, S. C.; Toccoa, Ga.; Cedarville, O.; Shirley, Ind.; Glendive, Mont.; Orono, Me.; Stockton Springs, Me.; Olympia, Wash.; Kingsley, Mich.

LaCrosse, Wis.—Common council passed a resolution Jan. 13 providing for the appointment of a committee to engage an expert hydraulic engineer to determine whether or not a filtration system will be the best method of improving the water supply of this city. Mayor Torrance is chairman of the committee.

Atlantic City, N. J.—Plans have been completed for laying new mains from the artesian well pumps to the concrete well basin, constructing a concrete gate chamber with iron gates to regulate the flow at the outlet of the wooden conduit connecting Doughty's pond and the reservoir, and building a tool and machine shop.

Providence, R. I.—The board of aldermen concurred Jan. 19 with the common council in its action to provide an improved water supply for this city, involving an expenditure of about $300,000. The plan includes the building of two new filter beds at Pettaconset, and the laying of a leading main, either 36 or 42-ins. in diameter, from the Sockanosset reservoir to the city.

CONTRACTS TO BE LET.

Pocatello, Idaho—Bids are asked until March 31 for furnishing 500 water meters. Pocatello Water Co.

Chrisman, Ill.—Bids are asked until Feb. 7 for constructing a water-works system. J. T. Johnson, Mayor.

Schoharie, N. Y.—Bids are asked until Feb. 22 for constructing a water-works system. H. F. Kingsley, Village Clerk.

Norwood, Ohio—Sealed bids are asked until Feb. 11 for the extension of the water mains. E. R. Edwards, Clerk B. P. S.

Chariton, Iowa—Bids are asked until March 1 for constructing and equipping a water-works system. B. R. Van Dyke, Water-Works Commissioner.

Fort Keogh, Mont.—Bids are asked until Feb. 9 for installing a water supply system. W. W. Robinson, Jr., C. Q. M., St. Paul, Minn.

Fort McKinley, Me.—Bids are asked until Feb. 15 for furnishing and installing a steam pump. Capt. A. W. Yates, C. Q. M., Portland.

St. Paul, Minn.—Bids are asked until Feb. 9 for the installation of a water supply at Fort Keogh, Mont. W. W. Robinson, Jr., C. Q. M.

South Bend, Ind.—Bids are asked until Feb. 8 for furnishing all c. i. coated water pipe, bell and spigot pattern required during 1905. W. A. McInerny, B. P. W.

Asbury Park, N. J.—Sealed bids are asked until Feb. 13 for furnishing and erecting a 200-horsepower internal furnace tubular boiler. John L. Coffin, superintendent water and sewers.

Jacksonville, Fla.—Bids are asked until Feb. 6 four furnishing a single acting triplex steam pump, geared to a 3-phase 210 volt induction motor. Bids will also be received for sinking a 10-inch artesian well. R. N. Ellis, superintendent W. W.

LOS ANGELES, Cal.—Sealed bids are asked until March 15 for constructing the Laguna dam and sluice ways, involving the excavation of about 305,000-cu. yds. of solid rock, placing of 305,000-cu. yds. of solid rock in the dam and masonry core walls building about 27,150-cu. yds. of concrete, laying about 80,000-sq. yds of paving and furnishing and driving about 53,000-lin. feet of sheet piling. U. S. Reclamation Service, 1108 Braly Bldg., Los Angeles.

CONTRACTS AWARDED.

Owensboro, Ky.—The contract for constructing a water works system has been awarded to the Trapp Construction Co.

Osceola, Neb.—The contract for erect-

ing a stand pipe for the local water company was awarded to Drake, Williams, Mount & Co. of Omaha for $4,377.

Pittsburg, Pa.—Special.—The clay awarded Jan. 6 a contract for 5,000 water meters, ranging in rise from ⅝" to 6" inclusive, to the Pittsburg Meter Co. of East Pittsburg, Pa. It is the intention of the city of Pittsburg to meter every water consumer in the near future, which will require in the neighborhood of 75,000 meters, so that the contract which has just been placed really represents but a small portion of the city's prospective purchases of meters. This initial contract represents a monetary outlay of between $50,000 and $60,000."

BRIDGES.

Bangor, Pa.—The construction of two bridges is proposed by town council.

Topeka, Kas.—Bids are asked until Feb. 6 for building 6 bridges. J. H. Squires, cy. clk.

Stockton, Cal.—Bids are asked until Feb. 7 for building a steel bridge at New Hope Landing. Bd. supvrs.

Aberdeen, Wash.—The question of building a bridge across the Chehalis river is being revived. Cy. coun.

York, Neb.—Bids are asked until Feb. 20 for constructing new bridges during the year. C. C. Boislaw, co. clk.

Hartford, Conn.—The bd. of st. comrs. contemplate building 2 bridges, one steel and one stone arch, on Albany-ave.

Sherbrooke, N. D.—Bids are asked until Feb. 13 for repairing 2 old and constructing 10 new bridges. S. McPherson, co. audt.

Hilo, Hawaii—Special—Robert Hawzhurst, jr., P. O. Box 146, is interested as a possible purchaser in steel bridges and viaducts.

Brookhaven, N. Y.—The town board decided to build 2 bridges over Patchogue river, one at Division-st. and one at Centre Moriches.

Vincennes, Ind.—Bids are asked until Feb. 8 for building an 80-ft. truss bridge on concrete abutments. John T. Scott, co. audt.

Covington, La.—A new steel bridge across Bogue River will be built at this place. Geo. Keopp, jr., M. C. Day, L. T. Miles, com.

Kearney, Neb.—Bids are asked until Feb. 21 for erecting an 800-ft. bridge over the south channel of the Platte River. A. V. Offil, co. clk.

Indianapolis, Ind.—Sealed bids are asked until Feb. 7 for building a bridge over White River at River-ave. John McGregor, chmn. bd. co. comrs.

Indianapolis, Ind.—Special.—The Block Bridge and Culvert Company, 108 N. Delaware-st., is interested in concrete steel bridges. H. F. Hackedon, sec'y.

Stillwater, Minn.—Preliminary steps have been taken by the city council for building a new bridge across Lake St. Croix, between this city and Houlton.

Dayton, Nev.—Bids are asked until Feb. 6 for building a bridge across Walker River, in Mason Valley. The bridge will be of wood or steel. T. W. Melarkey, co. clk.

Sterling, Ill.—Bids are asked until Feb. 2 for constructing a 50-ft. plate girder steel bridge across Sugar Creek on Hoover road. M. W. Jones, chmn. co. comrs.

Macon, Ga.—The construction of an arch bridge or a viaduct over the Southern & Macon, Dublin & Savannah Railway tracks in front of Central City Park is contemplated.

Cincinnati, O.—Sealed bids are asked until Feb. 18 for new wood work on the iron bridge over Great Miami River, at Miamitown, Whitewater twp. E. L. Lewis, co. audt.

Charleston, W. Va.—Bids are asked until Feb. 16 for building a truss bridge bridge across Elk River, with concrete, brick floor and two cement sidewalks. W. A. Hogue, cy. engr.

Port Clinton, O.—Sealed bids are asked until Feb. 17 for constructing the superstructure of a bridge over the Portage river on Ryer Road, Harris twp. Henry Pafenbach, co. audt.

Rensselaer, N. Y.—The construction of a bridge across the Central-Hudson and Boston & Albany R. R. tracks at Third-st., for the use of vehicles, is proposed by the bd. of aldermen.

Haverhill, Mass.—The County Commissioners have decided to locate the proposed new bridge across Merrimac River at the junction of River and Washington-sts. Robt. R. Evans, cy. engr.

Newfane, N. Y.—The town authorities have petitioned the supervisors for authority to issue $13,750 bonds for the purpose of building a new bridge over Eighteen Mile Creek.

Columbus, O.—Sealed bids are asked until Feb. 16 for constructing the substructure and superstructure, approaches and concrete arch roadway, and paving construction on the superstructure of the Hubbard road bridge, over P., C., C. & St. L. Railway in Prairie twp. L. E. Jones, co. audt.

PARKS.

Three Rivers, Mich.—This city decided Jan. 12 to purchase twelve acres of land for public park purposes.

New York City—The Washington Heights local board of improvements will acquire possession of the old Hamilton estate and convert it into a park.

New York City—The five borough presidents have made a joint report to the bid of estimate, recommending the purchase of land for more than a score of new parks in Greater New York at a cost of $13,000,000.

STREET LIGHTING.

Greenfield, Mass.—A municipal electric lighting plant is proposed.

Huntsville, Utah.—The citizens are discussing a plan for constructing an electric light plant.

Bayonne, N. J.—A municipal electric light plant is proposed and favored by Mayor Thomas Brady.

Alexandria, Va.—Common Council has appropriated $6,000 for improvements to the city gas works.

Cayuga, Ind.—Town Board is considering the feasibility of establishing an electric light plant.

Trenton, N. J.—The feasibility of establishing a municipal electric light plant is beng discussed.

Canastota, N. Y.—The question of building a municipal electric light plant will probably be voted on.

Steubenville, O.—Council is considering the question of building a municipal electrc light plant.

Melrose, Mass.—Mayor Sidney H. Buttrick recommends the establishment of a municipal electric light plant.

Clinton, N. Y.—Bids will be received soon for constructing an electric light plant. H. E. Thomas, vil. clk.

Temple, Tex.—Bids are asked until Feb. 15 for the construction of a gas plant. F. D. Lyon, prest. Texas Gas Co.

Gifford, Ill.—The citizens of this town have organized an electric light company and will build a plant next summer.

San Antonio, Tex.—C. A. Zilker is interested in a plan to organize an independent electric lighting company here.

Lansdale, Pa.—This town will vote in February on the issue of bonds for extending and improving the electric light plant.

West Point, N. Y.—Bids are asked until Feb. 5 for constructing and installing Corliss engines for electric light. Q. M.

Burlington, Ia.—The organization of a stock company in West Burlington to establish an electric light plant is proposed.

Baltimore, Md.—Supt. McCuen thinks that the electric light specifications will be ready about the first of February for the action of the board of awards.

Eureka, Cal.—Bids are asked until Feb. 14 for a franchise to maintain and construct certain poles and wires over highways in Humbolt county. W. H. Haw, clk.

San Diego, Cal.—Special—H. T. Richards, 30 Keating Blk., advises us that he is interested in extensive steam and electric railway building, and heavy work of all kinds.

Laconia, N. H.—City council desires to let a contract for furnishing arc and lights and incandescent street lighting for a term of 10 years. J. G. Quimby, chairman committee on lighting streets.

Knoxville, Tenn.—City council passed resolutions Jan. 6 favoring municipal ownership of the electric light plant and appointed a committee to confer with the electric light commission regarding the matter.

Lindsborg, Kas.—Special—The question of issuing $30,000 bonds for the construction of an electric light and water works plant will be voted on Feb. 14. N. J. Thorstenberg, mayor; A. A. Abercrombie, cy. clk.

Metuchen, N. J.—The Metuchen Gas & Electric Light Company has been organized and will begin at once the work of laying gas mains through Raritan twp. and erecting plant here, and enter into competition for the lighting of this place.

Boston, Mass.—The board of aldermen voted Jan. 9 to pass the ordinance recently adopted by common council authorizing this city to acquire and maintain gas plants for the manufacture and distribution of gas and electricity for lighting purposes.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Los Angeles, Cal.—New methods of street cleaning are being considered.

Davenport, Ia.—The Mississippi Valley Garbage Destroying and Fuel Company has been incorporated here.

Des Moines, Ia.—The council committee has agreed that a garbage plant is necessary for this city.

Atlantic City, N. J.—Bids are asked until Feb. 13 for the collection of garbage. Chas. W. Mathis, chmn. sanitary com.

Albany, N. Y.—Bids are asked until Feb. 6 for the removal of street dirt and dead animals. Isidore Wachsman, clk. bd. cont.

Chicago, Ill.—Bids will be received until Feb. 16 for the collection, removal and disposal of garbage. F. W. Blocki, comr. pub. wks.

Washington, D. C.—Sealed bids are asked until Feb. 6 for furnishing and erecting a coal and ash handling machine for the sewerage pumping station. H. B. F. MacFarland, chmn. Dist. corms.

FIRE APPARATUS.

Fort Dodge, Ia.—The fire department is in need of new hose.

Victoria, Tex.—This city has installed a Gamewell fire alarm system.

Elizabeth, N. J.—The fire commissioners have recommended the purchase of a combination chemical wagon.

East Grand Forks, Minn.—Bids are asked until Feb. 7 for 1,000 ft. of 2½ in. rubber lined cotton fire h[illegible] E. R. Jacobi, recorder.